DOCUMENT RESUME

ED 031 072 EF 003 550

By-Kohn, Sherwood

The High School Auditorium, 6 Designs for Renewal. A Report from Educational Facilities Laboratories.

Educational Facilities Labs., Inc., New York, N.Y.

Pub Date Feb 67

Note-56p.

EDRS Price MF-$0.25 HC-$2.90

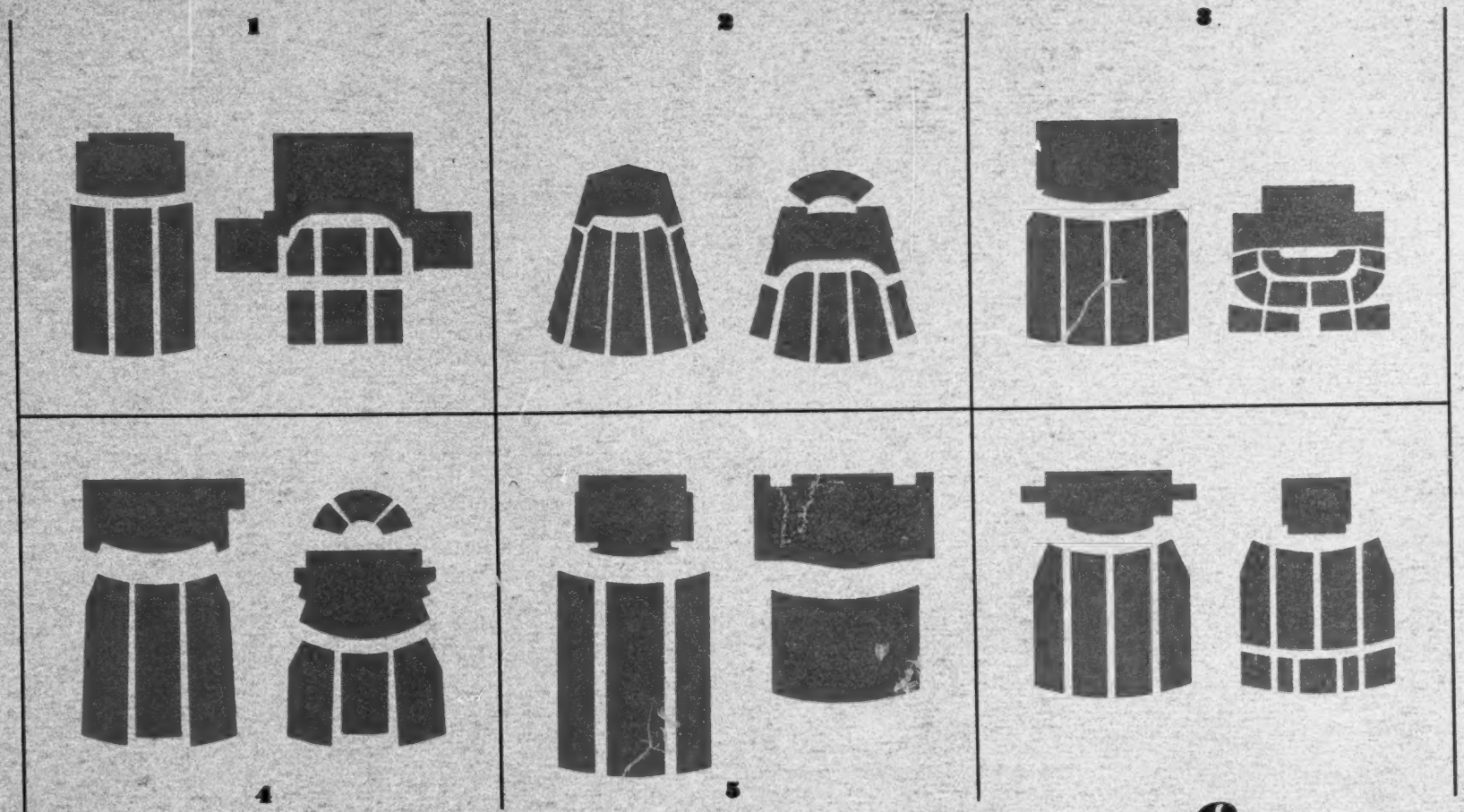
Descriptors-*Auditoriums, *Building Conversion, Building Design, Building Innovation, *Space Utilization

High School auditoriums are often much too large, serve a limited number of functions, and are unused a major portion of the year. This paper details designs for auditorium modification in six high schools aimed at making the space more usable for such functions as small lectures, lunchrooms, libraries, etc. This document previously announced as ED 018 084. (JT)

ED031072

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.



The High School Auditorium 6 Designs for Renewal

A Report from Educational Facilities Laboratories

EF 003550

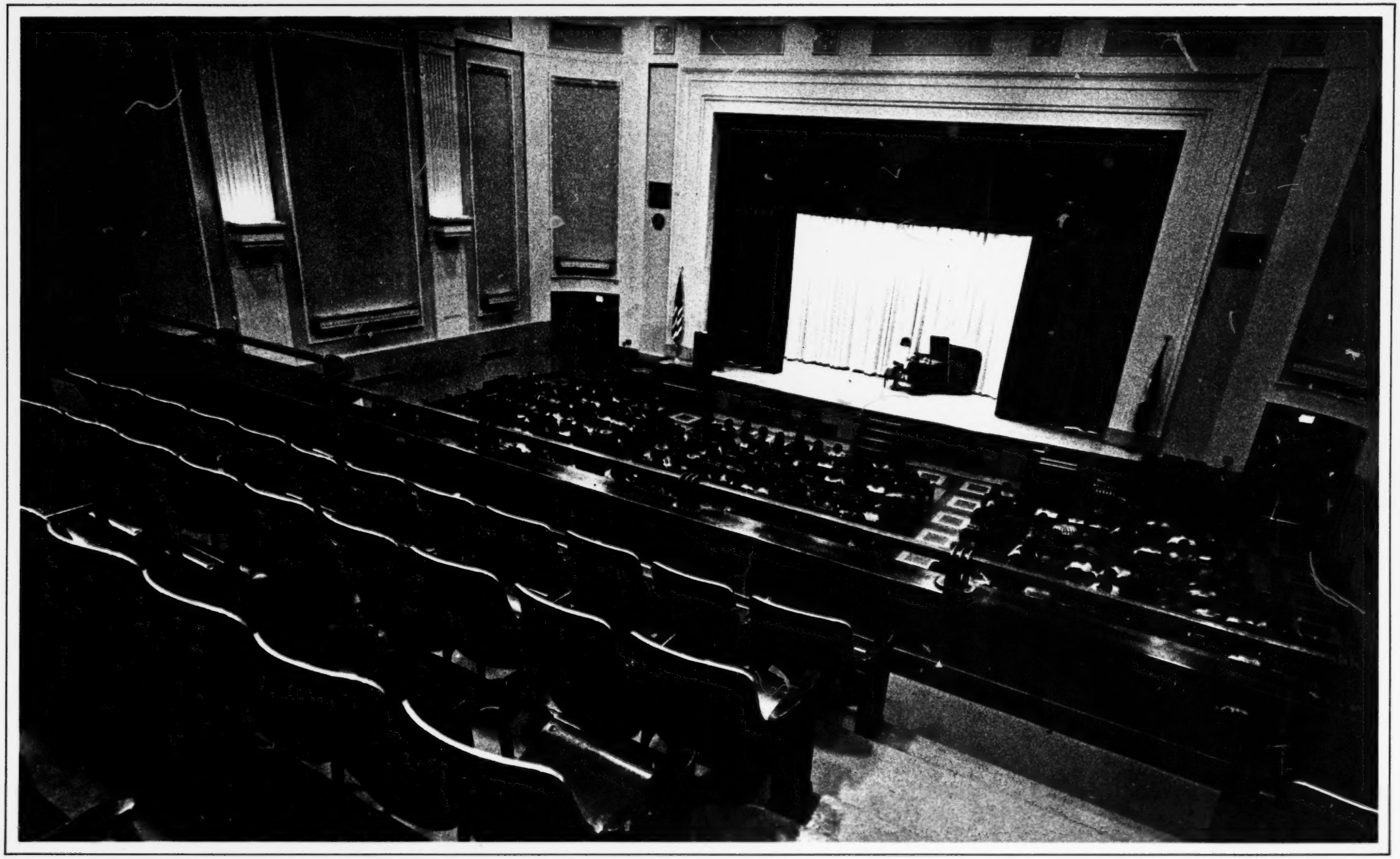
Portfolio of Designs for Renewal

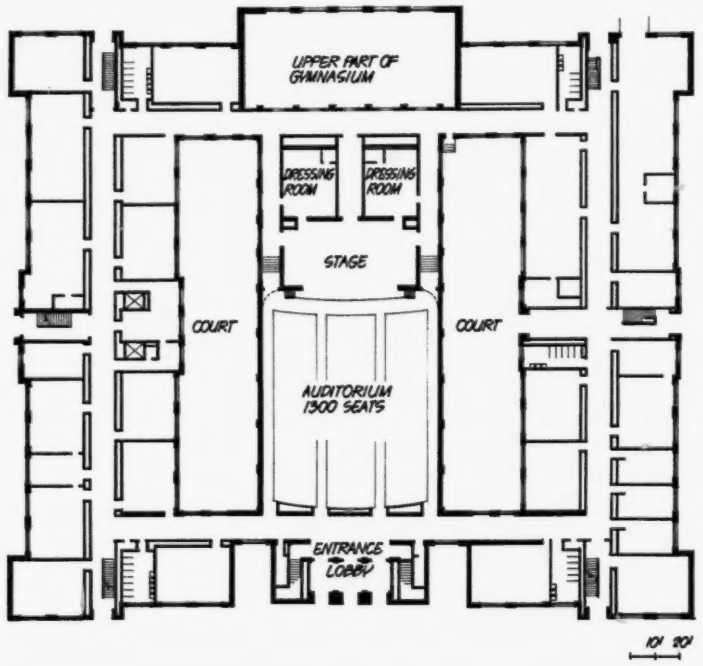
1 Central Junior High School, Rochester, Minnesota
2 John Marshall Senior High School, Rochester, Minnesota
3 Roosevelt High School, St. Louis, Missouri
4 Penn High School, Mishawaka, Indiana
5 Central High School, West Allis, Wisconsin
6 Roosevelt High School, Des Moines, Iowa

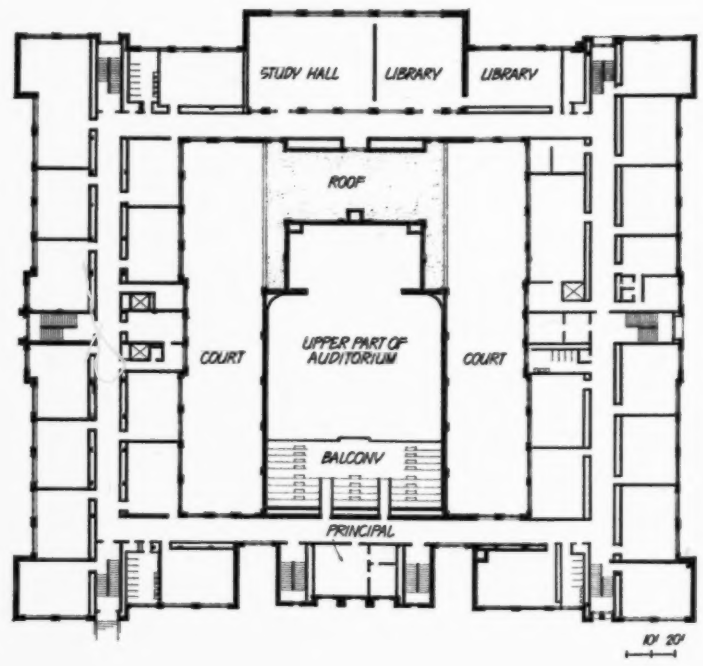
Tone indicates proposed renovations.

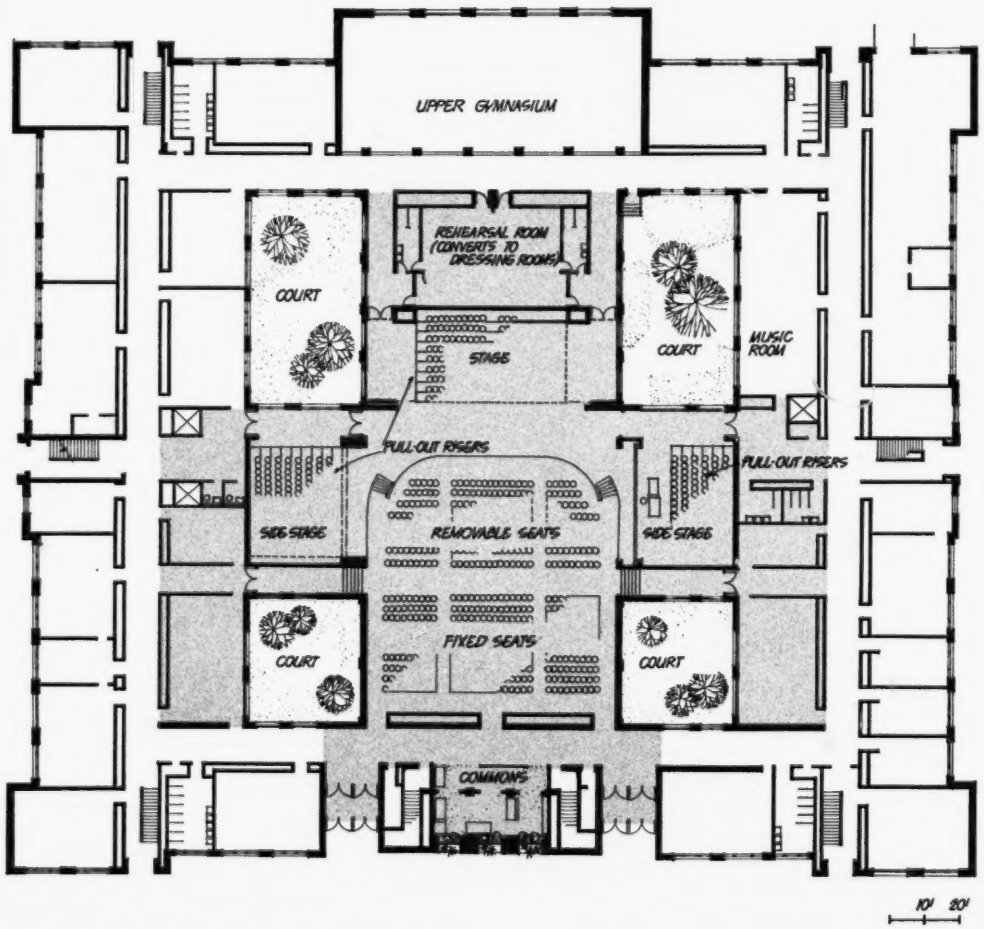
Versatility on a Tight Site

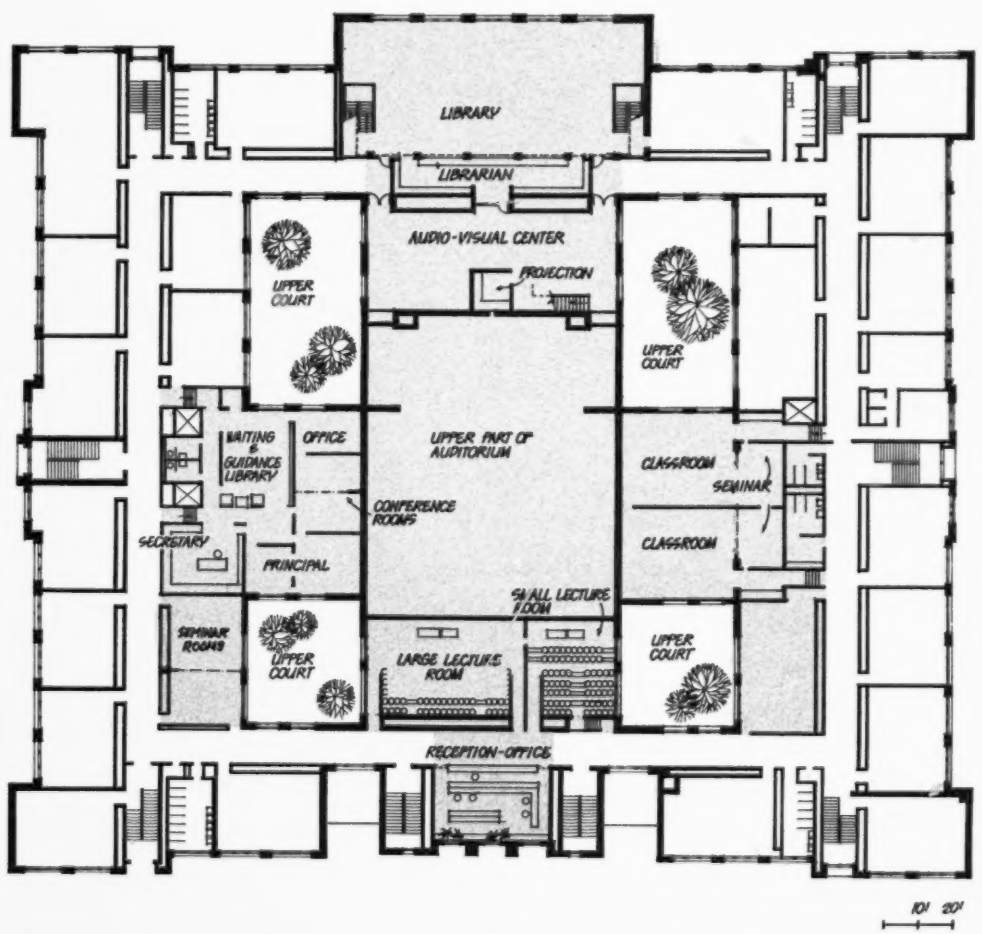
1





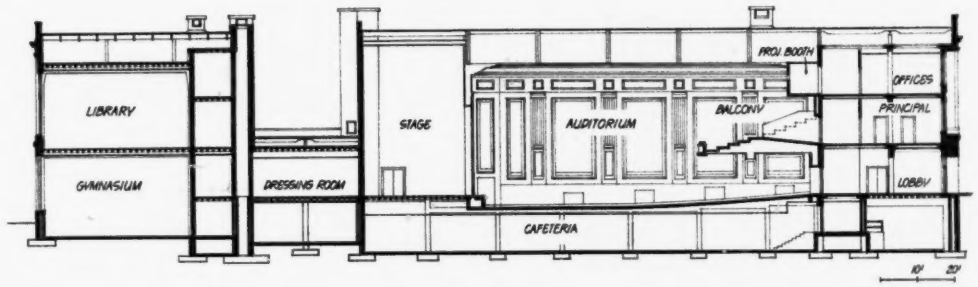


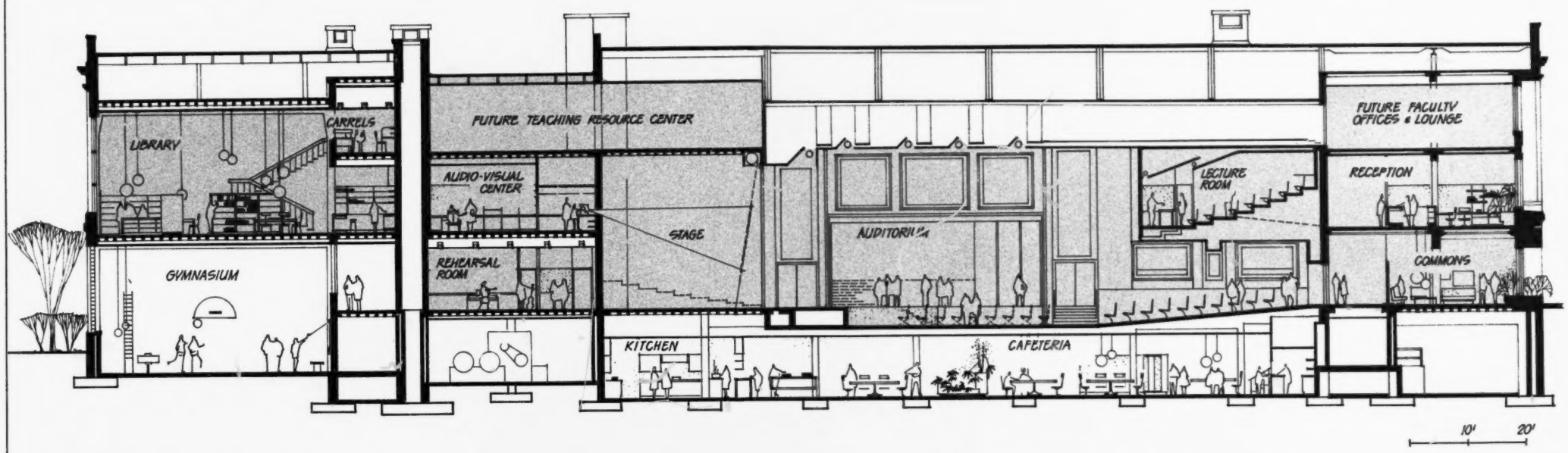




Flanked by two generous courts, necessary for of a 570-seat main floor area, two side spaces of separated from the auditorium and divided into

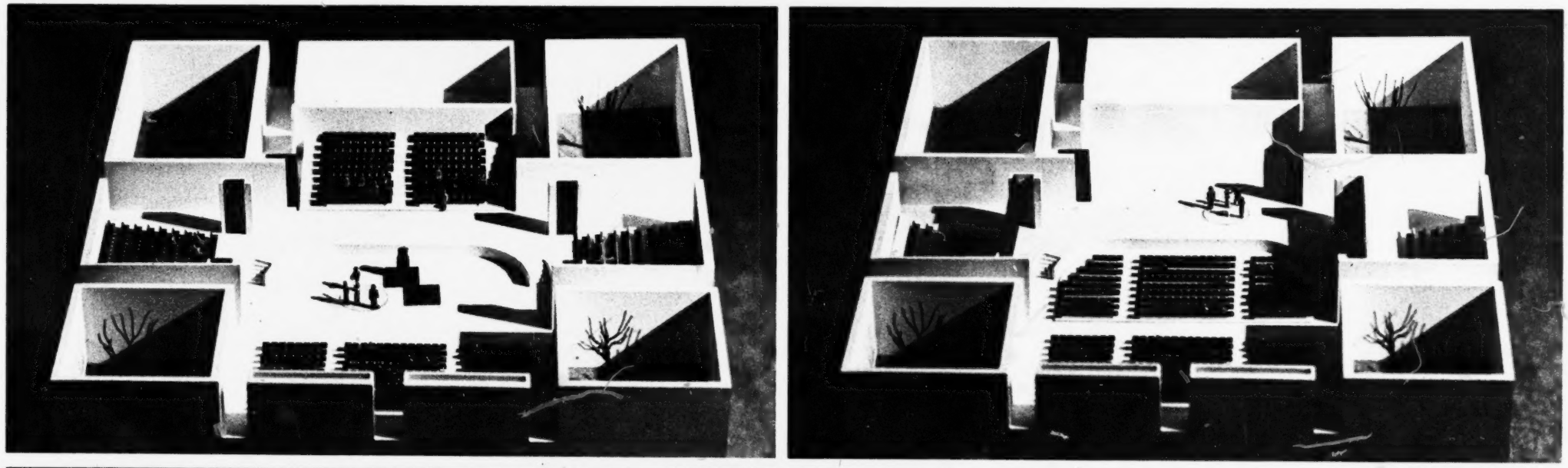
Flanked by two generous courts, necessary for light and air when the school was built, but now obviated by modern developments in artificial lighting, ventilation, and air conditioning, the auditorium of Central Junior High School lends itself easily to change. On its main floor, the hall is expanded by breaking through into the light wells and building new side areas. These areas are partitioned off into two 90-seat lecture rooms by sound-retardent folding walls. Pull-out risers with folding upholstered chairs permit the spaces to be used as side stages or auditorium seating areas for theater in the round. As redesigned, the auditorium consists of a 570-seat main floor area, two side spaces of 120 seats each (when pull-out risers are fully extended) and a main stage. The front rows of seating are removable to leave the floor open for a platform stage, and seating on the main stage makes theater in the round possible. While not indicated, 320 seats under the balcony can be separated from the main hall by folding partitions to serve as a large lecture room. Above the new side areas of the auditorium, the remodeling proposal calls for two 50-student classrooms and two seminar rooms to the right, and administrative and guidance center offices to the left. The balcony is shown permanently separated from the [illegible] two lecture rooms, a small one seating 70 and a large one seating 134. Both rooms are equipped with fixed seating and writing surfaces, and adequate conduits to each chair would facilitate future installation of teaching aids. Portions of the courts are retained as landscaped gardens, and the former dressing room space behind the stage can be utilized interchangeably as dressing rooms or a rehearsal hall. A student commons replaces the old lobby, and entrance traffic is redirected around it.





New space is enclosed on top of the existing dressing room area as an audio-visual center joined to an expanded library. A projection booth, located in the audio-visual center, provides the new auditorium with rear screen projection facilities. Another floor, provided by center and continuing the roof line of the present auditorium, offers space for a faculty work and resource center in close proximity to the library. Shifting of the principal's office to the second floor of the newly created side area opens up existing general office space for use as a reindicated in the above cross-section, the cafeteria and the kitchen, located on the floor below the auditorium, could be enlarged by excavation of the side light-well spaces, thus creating accommodations for 180 additional diners. Air conditioning is contemplated in all spaces

joined to an expanded library. A projection booth, located in the audio-visual center, provides the new auditorium with rear screen projection facilities. Another floor, provided by building over the ceiling of the audio-visual and resource center in close proximity to the library. Shifting of the principal's office to the second floor of the newly created side area opens up existing general office space for use as a reception room directly above the commons. As below the auditorium, could be enlarged by excavation of the side light-well spaces, thus creating accommodations for 180 additional diners. Air conditioning is contemplated in all spaces connected with the library and auditorium.



In its new configuration, the auditorium can be easily adjusted on short notice to seat 740, 570, or 250 persons. It is possible as well to use the modified space for a variety of classroom and lecture situations, still leaving 250 seats in the main portion of the hall for general assembly purposes. Allowing for a 55 per cent utilization of large spaces, it is possible to increase the student capacity of Central Junior High School by 600 while making major improvements in both library and cafeteria facilities. The estimated cost: $1,966 per student.

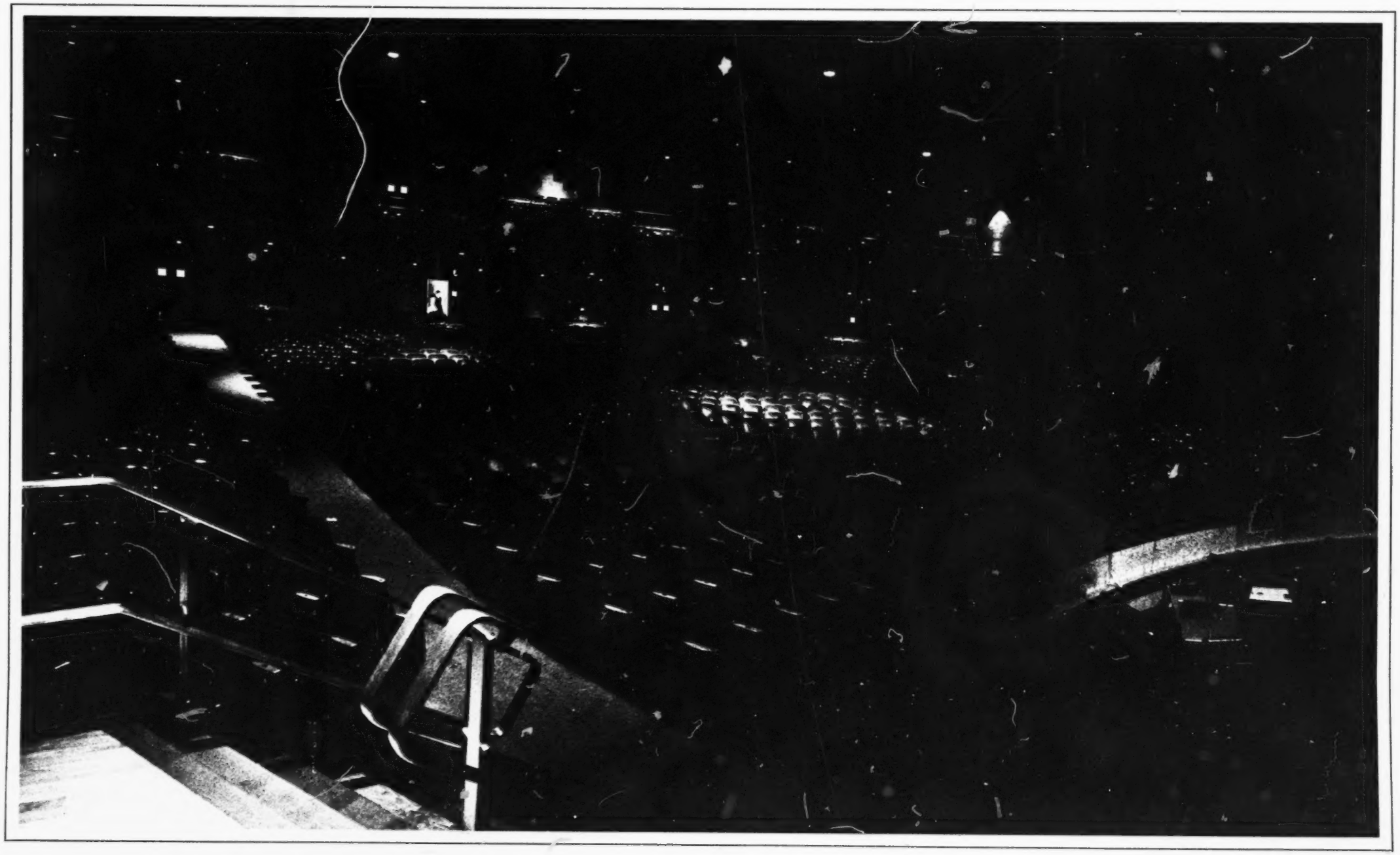
Central Junior High School, Rochester, Minnesota

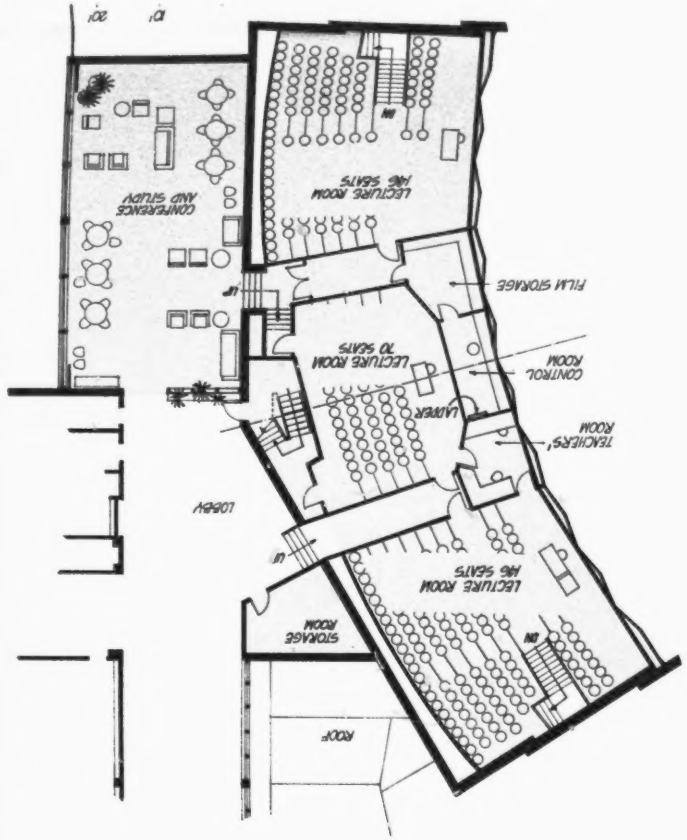
Central Junior High School, built in 1927, is located near the downtown area of Rochester, Minnesota. Land for additions is prohibitively expensive. The need for improvement of or additions to the cafeteria, library, faculty offices, guidance areas, and group instruction rooms, as well as the classrooms, will become crucial by 1970, when the present enrollment of 1,600 will expand to 2,000. Central's 1,300-seat auditorium is pleasantly and centrally located, but already too small for the total student body and too large for instruction. Its stage cannot comfortably accommodate the school orchestra and is suitable only for traditional forms of drama. The remodeling proposal illustrated here calls for major modifications, and according to consultant engineers, "is economically feasible only in connection with school plants on limited sites within a major metropolitan area." Estimates, in fact, placed the price of proposed modification at $1,180,000, while the cost of building new lecture room space for 600 students, constructing additional cafeteria seating and library space, plus the guidance area, student commons, and auditorium modifications, would be $1,320,000, excluding the prohibitively expensive land required. On the other hand, the improvement of Central's student capacity—a matter of 600 new places—represents the largest increase of any of the schools presented in this study.

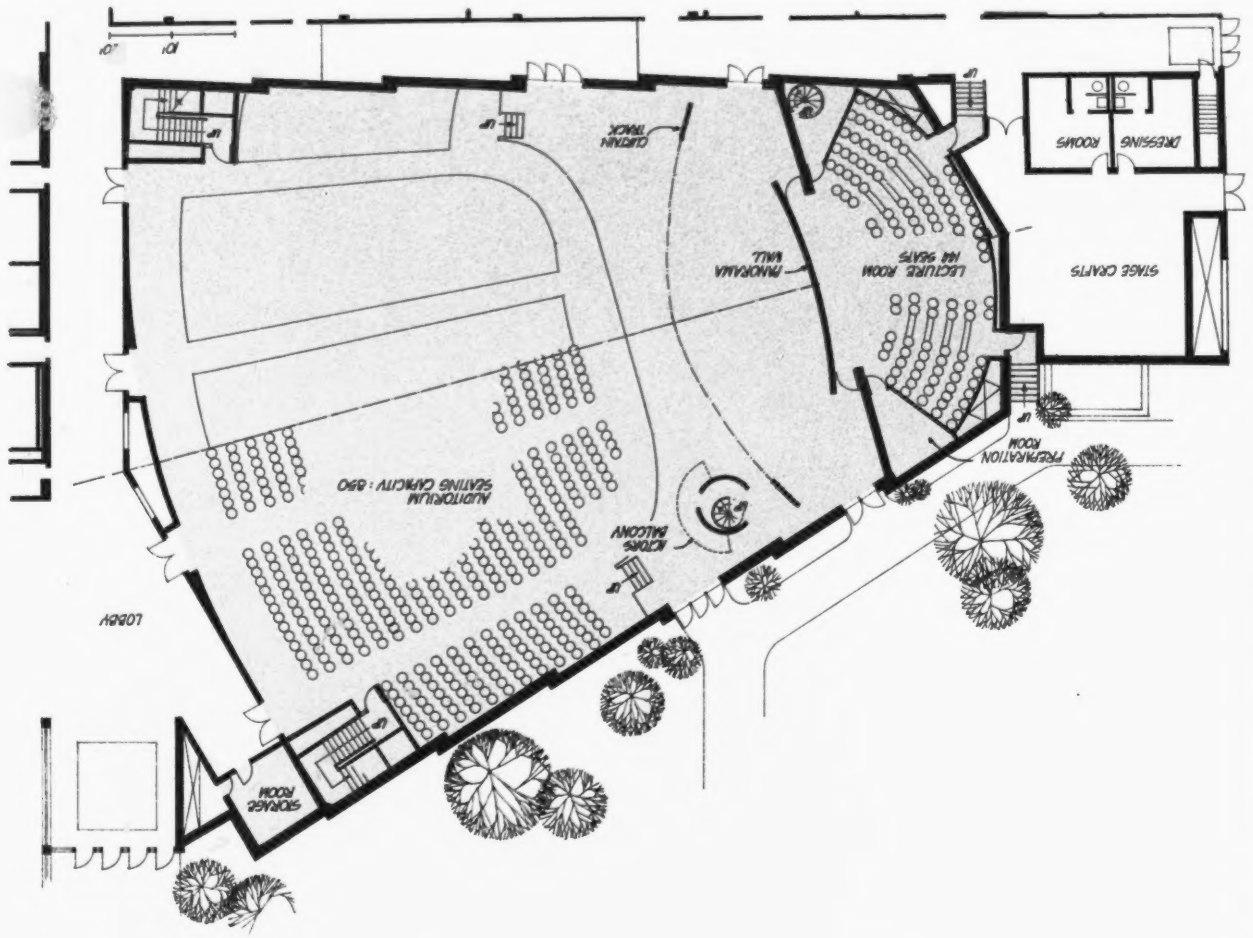
Superintendent, James V. Moon
Principal, Jennings O. Johnson
Architect for the original structure, Crawford & Bross, Associate Architects

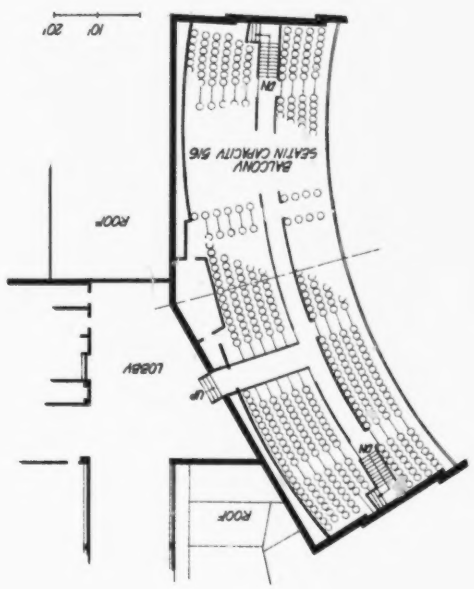
Conversion for Team Teaching

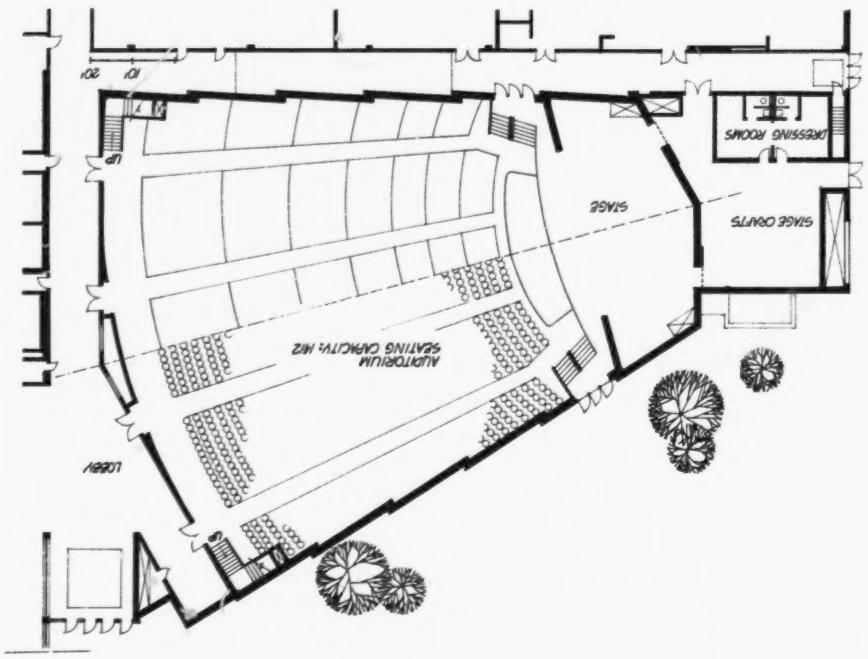
2



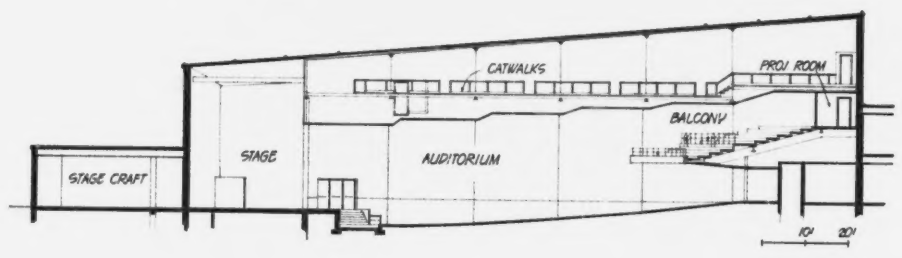

10'
20'
CONFERENCE AND STUDY
LECTURE ROOM
146 SEATS
FILM STORAGE
LECTURE ROOM
70 SEATS
CONTROL ROOM
LOBBY
LECTURE ROOM
146 SEATS
STORAGE ROOM
ROOF

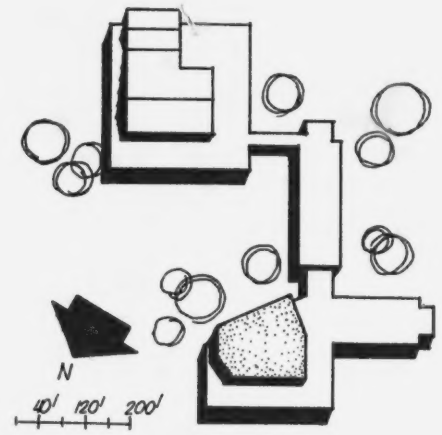

10'
20'
LOBBY
AUDITORIUM
SEATING CAPACITY: 850
CATWALK
MANORAMA HALL
LECTURE ROOM
144 SEATS
STAGE CRAFTS
DRESSING ROOMS
PREPARATION ROOM
ICONS BALCONY
STORAGE ROOM

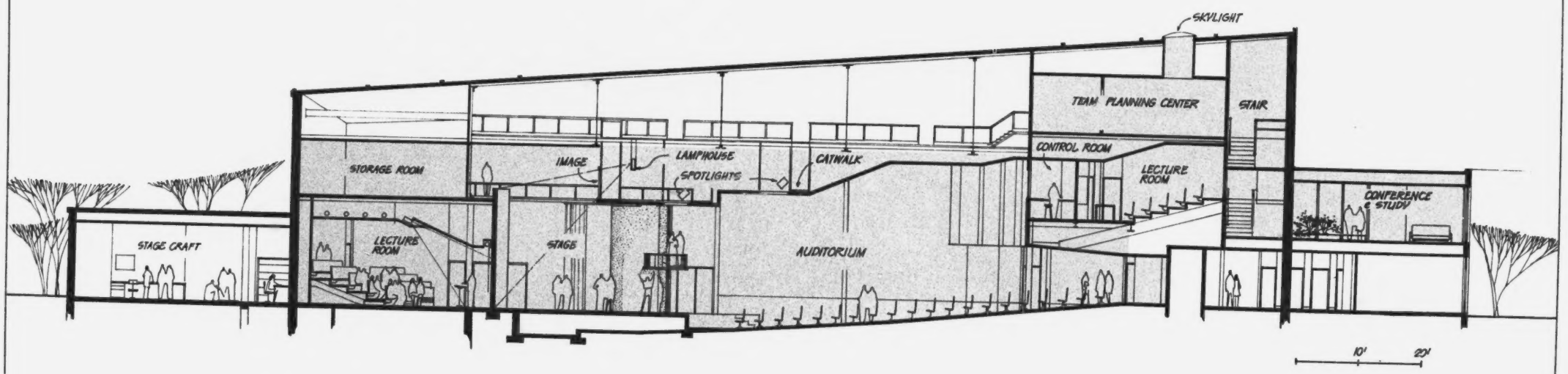

10'
20'
BALCONY
SEATIN CAPACITY 516
ROOF
LOBBY
ROOF


10'
20'
DRESSING ROOMS
STAGE
STAGE CRAFTS
AUDITORIUM
SEATING CAPACITY: 612
LOBBY

Size and sight-line reduction offer the easiest and most effective approach to efficient use of the wasted space in John Marshall's auditorium. In this proposal, the 516-seat balcony is permanently separated from the hall and divided into three lecture rooms, two with 146 seats and one with 70. The front rows of seats are removed to provide lecture platform space, and in the center, control booths housing projection, remote switchboard, spotlight, and television equipment could be constructed. The existing stage is walled off from the hall by the cyclorama of the new stage, fitted with tiered permanent seating, and equipped for the installation of individual audio terminals, automated response systems, and other electronic teaching aids, as a highly efficient lecture room. The first eight rows are removed from the main seating area, reducing the capacity of the hall to 850. A large, open-platform stage takes over the newly created space, and the old auditorium exits serve as stage entrances.

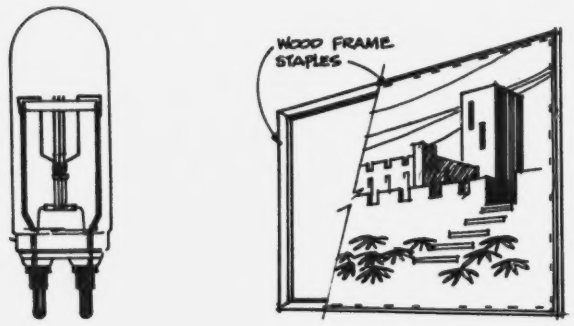






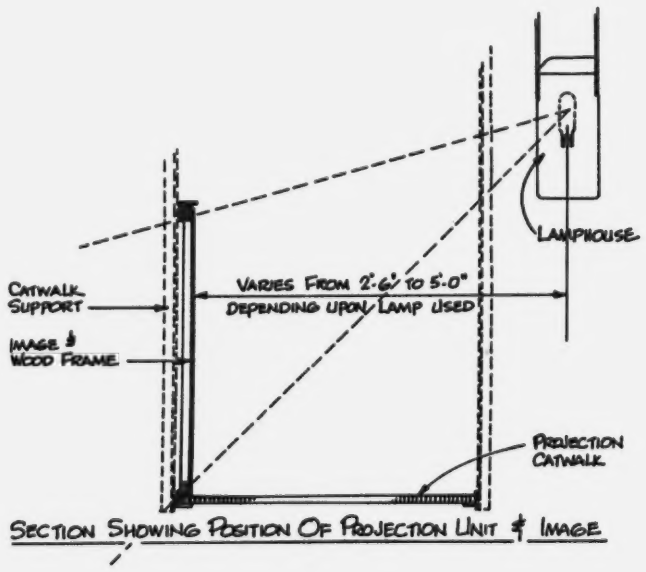
Above the stage, the ceiling is rebuilt to accommodate scenery projection equipment. A stage tower leads from the auditorium up to the catwalk, providing a permanent actor's balcony on the way. The ceiling, set at new angles for improved sound projection and acoustical control, contains new stage lighting equipment and supports a grid for hanging minor properties and small pieces of scenery. The fly loft of the old stage is converted to use as a storage room. The old projection booth becomes a new staircase leading to an area above the balcony ceiling, where a team planning center, divided into offices, common work space, and a conference area is provided. Skylights and glass partitions lend a spacious feeling to this reclaimed loft area.

Above the stage, the ceiling is rebuilt to accommodate scenery projection equipment. A stage tower leads from the auditorium up to the catwalk, providing a permanent actor's balcony on the way. The ceiling, set at new angles for improved sound projection and acoustical control, contains new stage lighting equipment and supports a grid for hanging minor properties and small pieces of scenery. The fly loft of the old stage is converted to use as a storage room. The old projection booth becomes a new staircase leading to an area above the balcony ceiling, where a team planning center, divided into offices, common work space, and a conference area is provided. Skylights and glass partitions lend a spacious feeling to this reclaimed loft area.

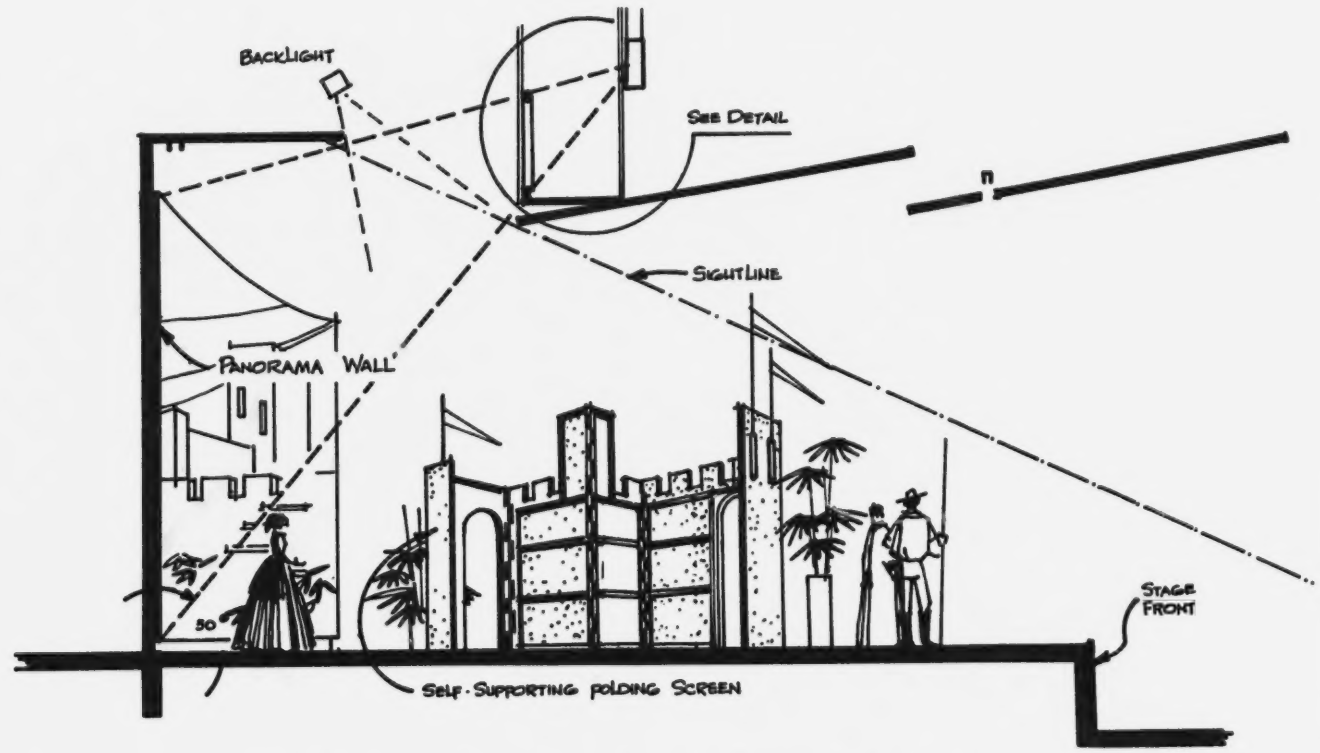


LAMP & IMAGE

MATERIALS FROM WHICH IMAGE CAN BE MADE INCLUDE CLEAR OR COLORED ACETATE WITH APPLIED DYES OR CUT-OUTS, SILHOUETTES CUT FROM HEAVY PAPER, WIRE MESH



SECTION SHOWING POSITION OF PROJECTION UNIT & IMAGE



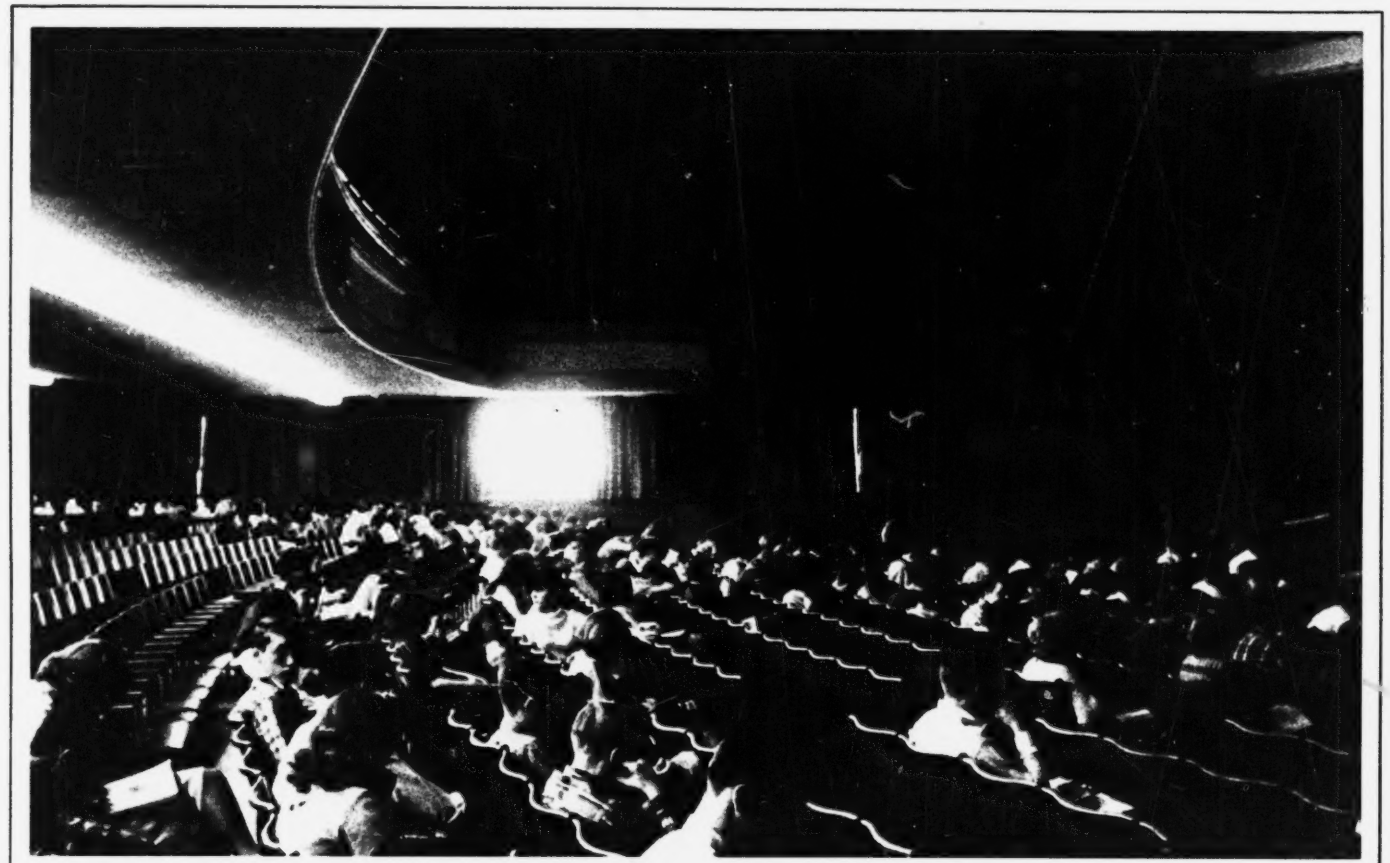
PROJECTION UNIT & IMAGE SHOWN IN RELATION TO STAGE

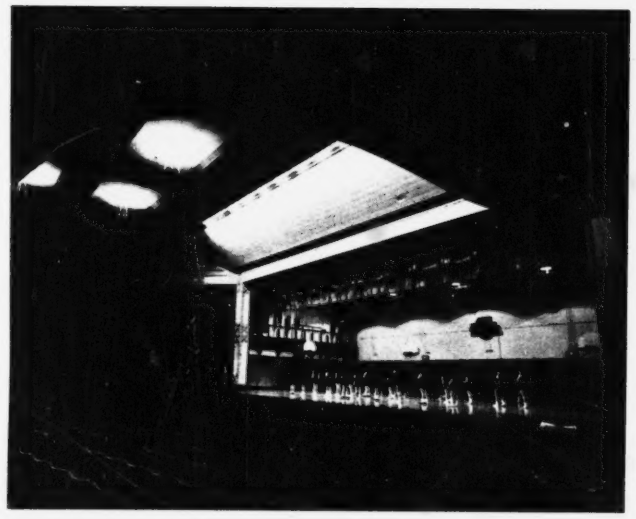
One of the bonuses derived from the John Marshall study is the hall's capacity to accommodate projected scenery. In these sketches, stage designer James Hull Miller has detailed the simple components of an effective projection method. A high-powered lamp provides sufficient light to cast an image from a clear or colored transparency onto the stage cyclorama. Mr. Miller's *further remarks on "stage design" will be found on page 16.*

John Marshall Senior High School, Rochester, Minnesota

Superintendent, James V. Moon
Principal, Robert Whaley
Architect for the original structure, Ellerbe & Company

John Marshall High School is relatively new—built in 1958—and located in a suburban area of Rochester, Minnesota. It is short of space to support a much-desired team teaching program. The 1,928-seat auditorium is too small to seat John Marshall's 2,262 students in one assembly, and too large and clumsy to house either teaching or studying situations. The distance from the back of the balcony to the front of the stage is 120 feet, far in excess of the 65 to 75 foot maximum recommended by theater consultants for successful communication between audience and performer. At John Marshall, space for more students is not the basic problem, although additional enrollment capacity would result as a by-product of remodeling. Efficient use of existing space is the crucial factor, and the study was undertaken to show how John Marshall's auditorium could be modified to suit the changing needs of both students and teachers. The result is a more appropriately sized assembly hall supported by an excellent team teaching complex consisting of a planning center, large-group instruction spaces, and independent study areas. Consultants estimate that this modification of the existing space to add four new lecture areas and to improve the auditorium would cost $448,000 as compared to $622,000 for the construction of new, equivalent facilities.

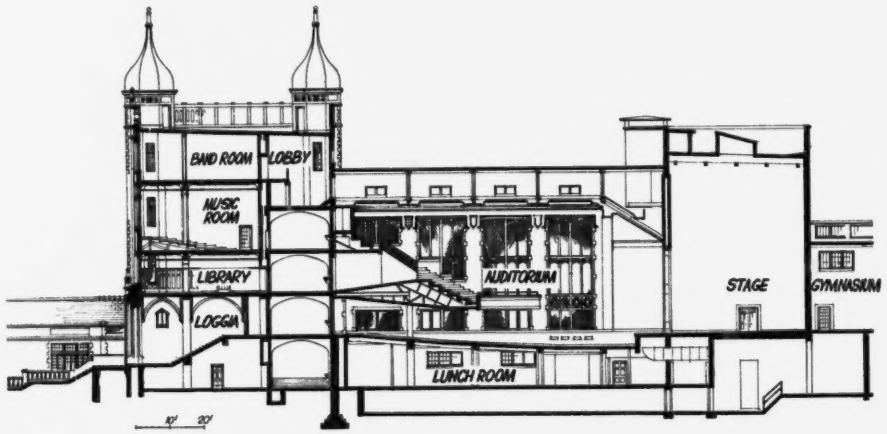


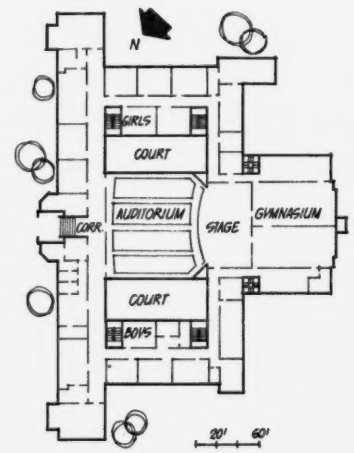


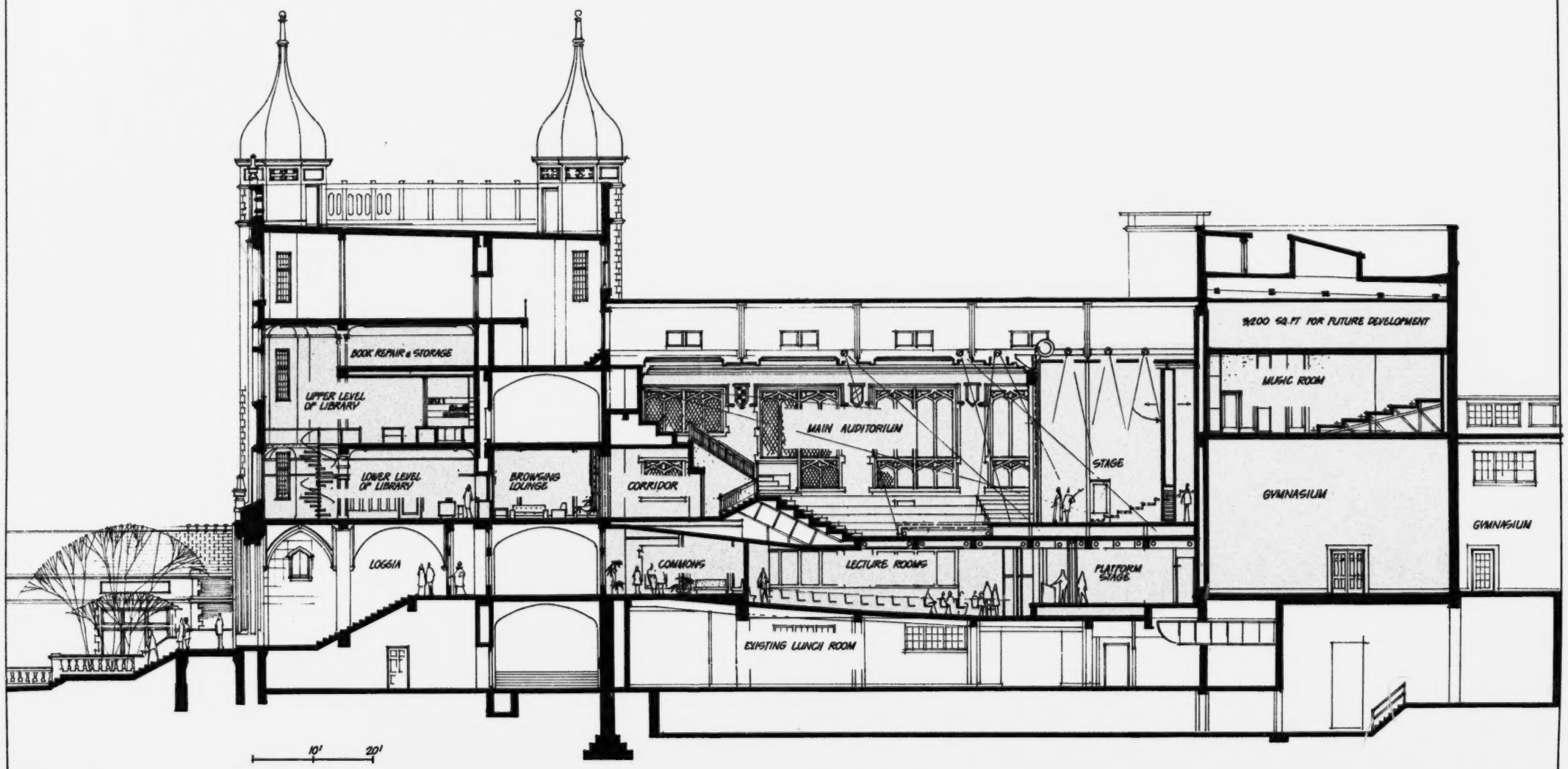
3

Gothic Efficiency or Sandwiching in a Lecture Center

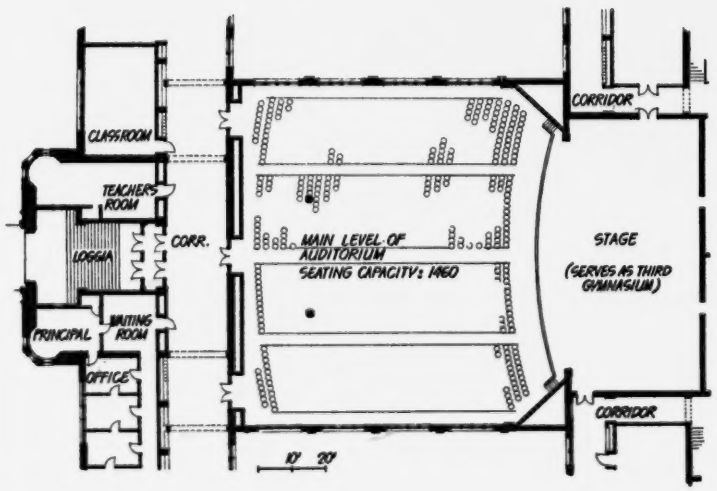
3

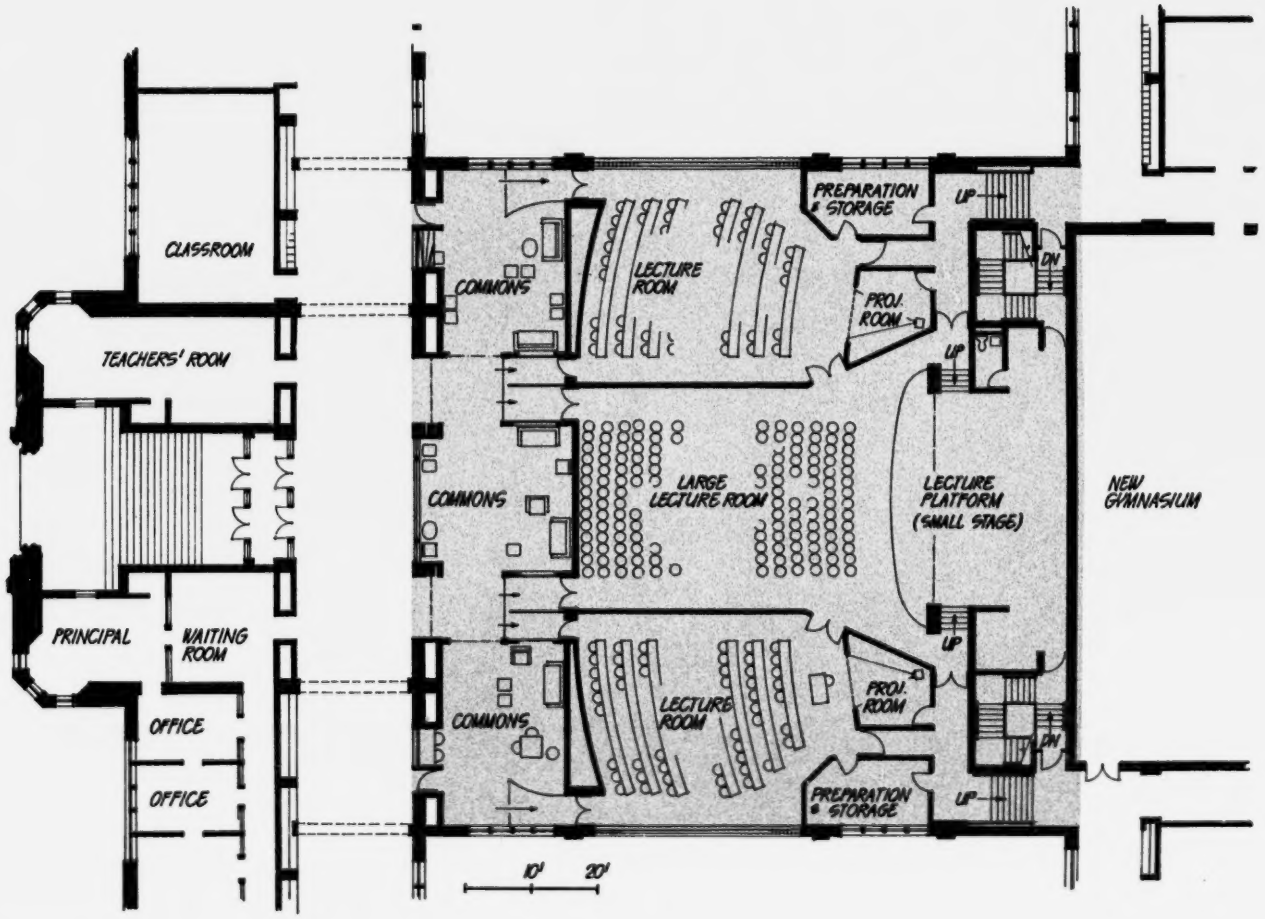

BAND ROOM
LOBBY
MUSIC ROOM
LIBRARY
LOGGIA
AUDITORIUM
STAGE
GYMNASIUM
LUNCH ROOM
10' 20'

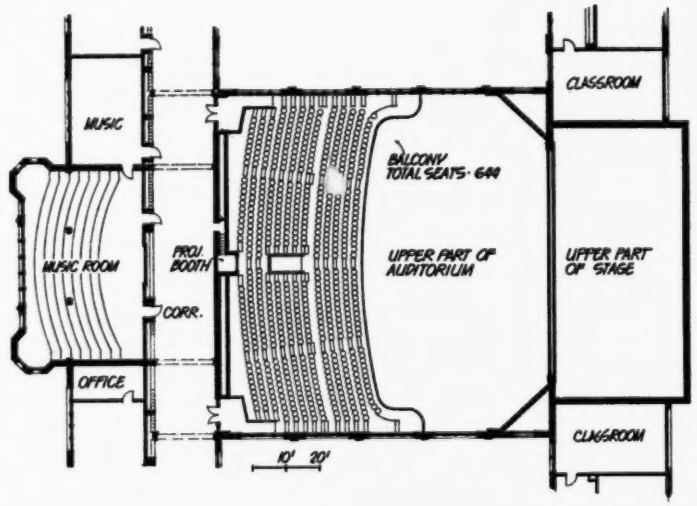

N
GIRLS
COURT
AUDITORIUM
STAGE
GYMNASIUM
CORR.
COURT
BOYS
20' 60'

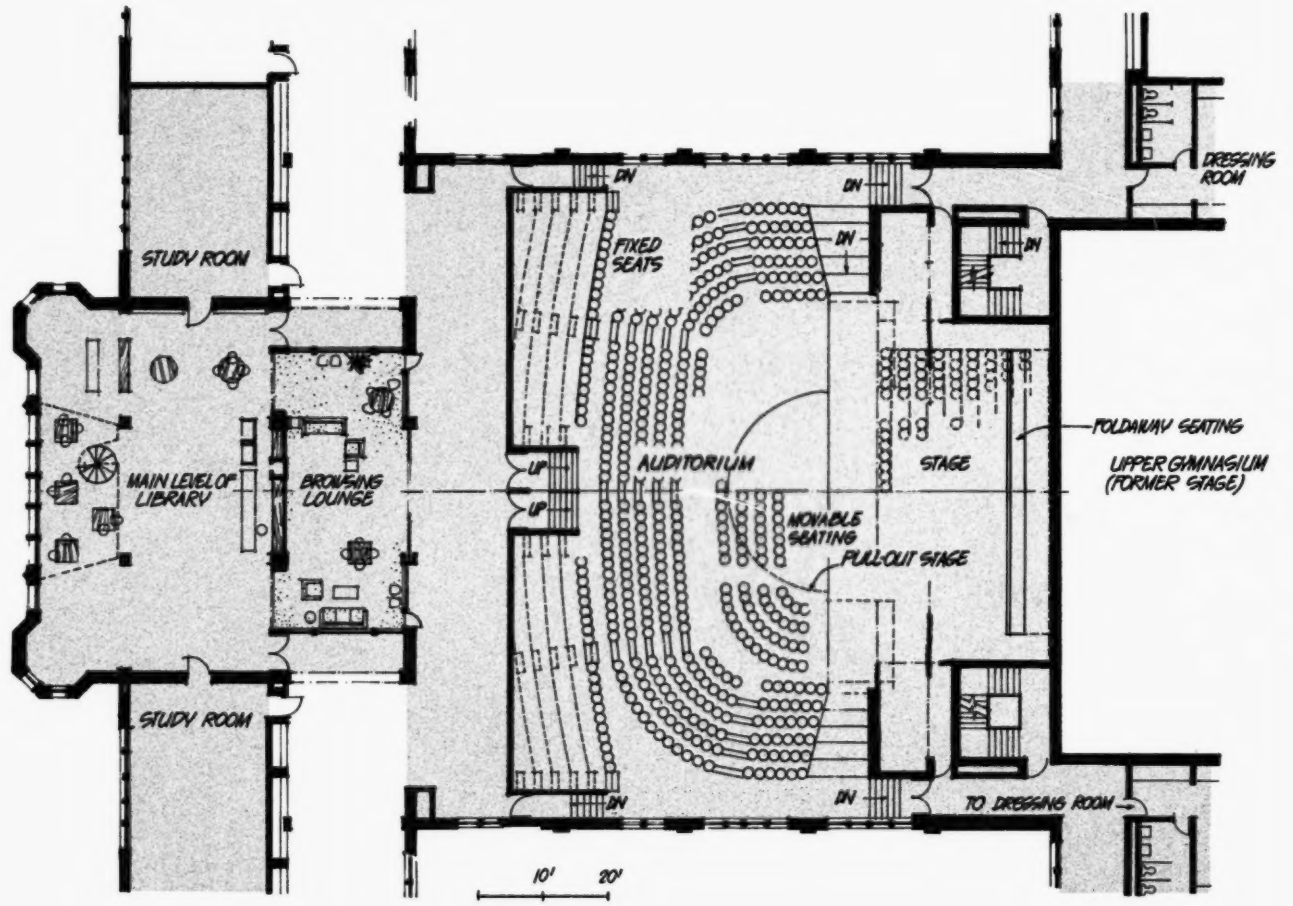

BOOK REPAIR & STORAGE
UPPER LEVEL OF LIBRARY
LOWER LEVEL OF LIBRARY
BROWSING LOUNGE
CORRIDOR
MAIN AUDITORIUM
STAGE
9,200 SQ.FT FOR FUTURE DEVELOPMENT
MUSIC ROOM
GYMNASIUM
GYMNASIUM
LOGGIA
COMMONS
LECTURE ROOMS
PLATFORM STAGE
EXISTING LUNCH ROOM
10' 20'

Since Gothic architecture affords great vaults of vertical space, it seemed logical to divide Roosevelt High School's auditorium horizontally, at the balcony level. In this way, it was possible to save the character of the house while reducing its seating capacity by one-half and providing a dramatic amount of space for other uses. As shown here, the existing stage proscenium is walled off, transforming that area into a permanent gymnasium. The new floor of the auditorium is built up to that wall, supporting a new stage. The curve of the balcony seating is extended around the sides and the center flat floor is used for a forestage or portable seating. Pull-out seats are stored against the new gym wall at the back of the stage and could be used for theater in the round. Horizontal division of the existing stage and fly loft provides space for the music room, displaced by the new upper level of the library, and supplies 3,200 square feet at the top for possible future development. The second-floor library is expanded into a browsing lounge by removal of the storage areas below the balcony's rear seats and rerouting of the second floor corridor. Existing study areas on either side of the main library become its new stack space.









As redesigned, the auditorium seats 814, with an additional 216 foldaway seats on the stage, and remains accessible, through new corner stairways and existing doors at the back of the hall, from both second and third floors. The hall's former main floor is divided vertically into three permanent lecture rooms. The rooms at the sides can each accommodate 170 students, and are equipped with fixed writing surfaces and swivel seating, for use as media-oriented or electronically supplemented lecture areas. The central lecture room holds 224 students in standard auditorium seating equipped with folding tablets. A platform stage makes the room usable as a little theater. The rear wall of the lower floor is moved forward to the balcony columns of the old hall, leaving space for a pleasant student commons area just off the main corridor, opposite the school's entrance.

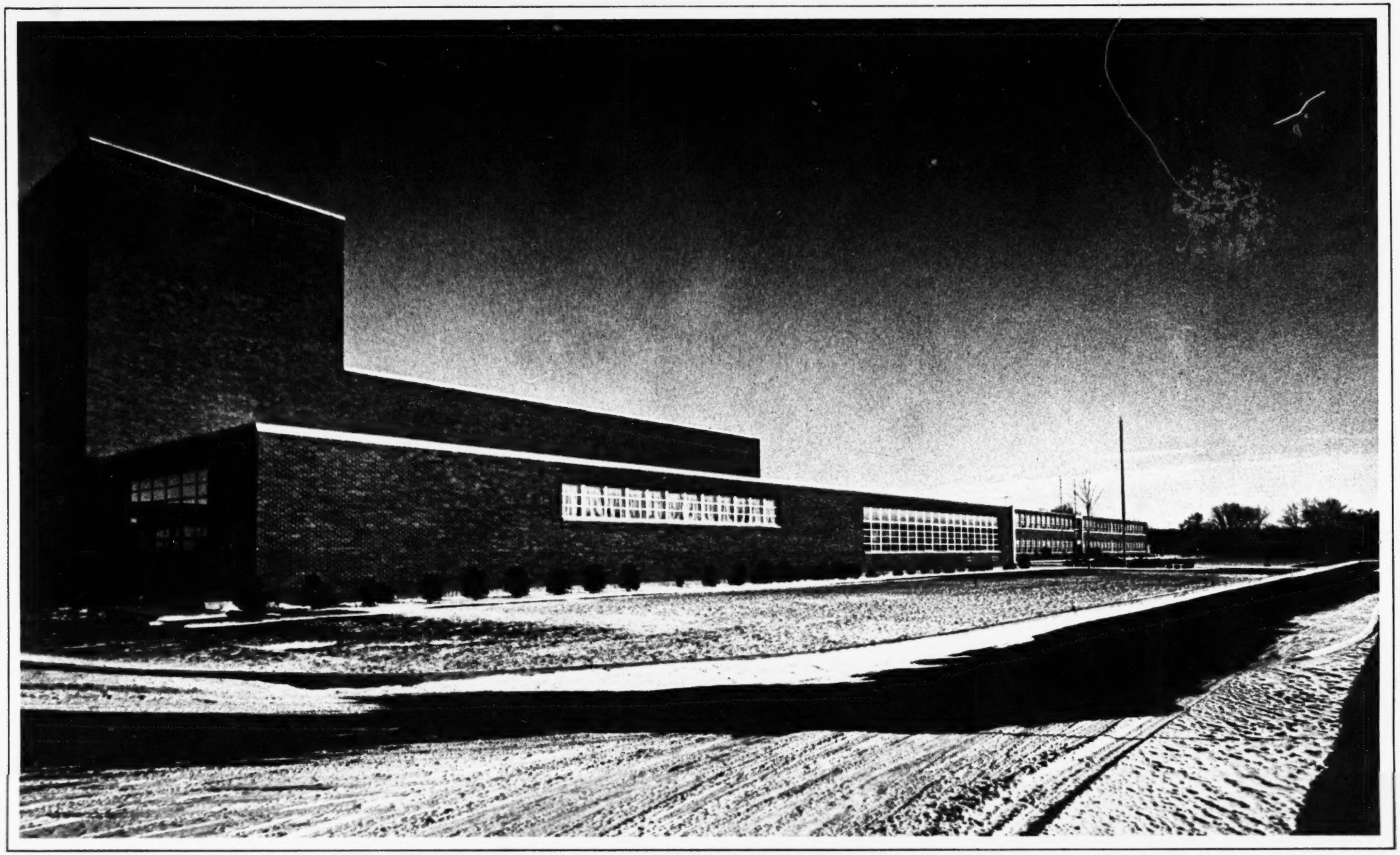
Roosevelt High School, St. Louis, Missouri

St. Louis' venerable Roosevelt High School, its 42-year-old spires influenced by the architecture of the city's 1904 exposition, and its site swallowed by the tide of urban concentration, suffers, like many other large schools, from a growing enrollment and an inability to expand onto adjacent land. Its 2,104-seat auditorium, a splendidly detailed Gothic space pierced by light through floor-to-ceiling windows, is located at the heart of the school. As an all-school assembly hall it has been outgrown by the 3,000-member student body. Conversely, it is much too large for any effective teaching purposes. The hall's main floor seats 1,460, but its generous stage is seldom used for theater and now doubles as physical education space. The 644-seat balcony is virtually dormant. The graciously curved "dress circle" of the balcony makes flexible partitioning almost impossible. A more efficient auditorium, additional classroom space, large-group lecture rooms, better library facilities, a little theater, and a gymnasium are all badly needed, but any plan for vertical division of the large hall to form these needed areas presented difficulties. It was also felt that any division should be achieved without destroying the distinctive architectural character of the house. The result was a bold proposal that can fulfill all requirements, increase the student capacity of the school by 480 places, turn a little-used but handsome auditorium into a highly active group of spaces, retain the dignity of an architectural classic, and cost an estimated $691,000 — substantially less than the $1,440,080 calculated for construction of an equivalent addition.

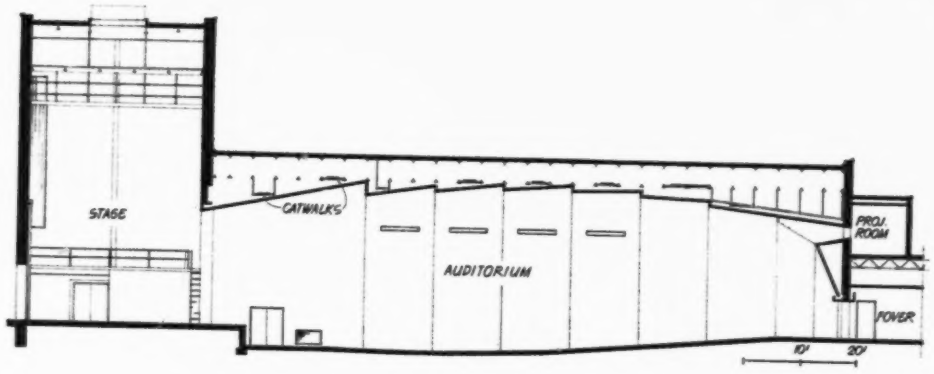
Superintendent, William Kottmeyer
Principal, Wilmar R. Schneider
Architect for the original structure, R. M. Milligan

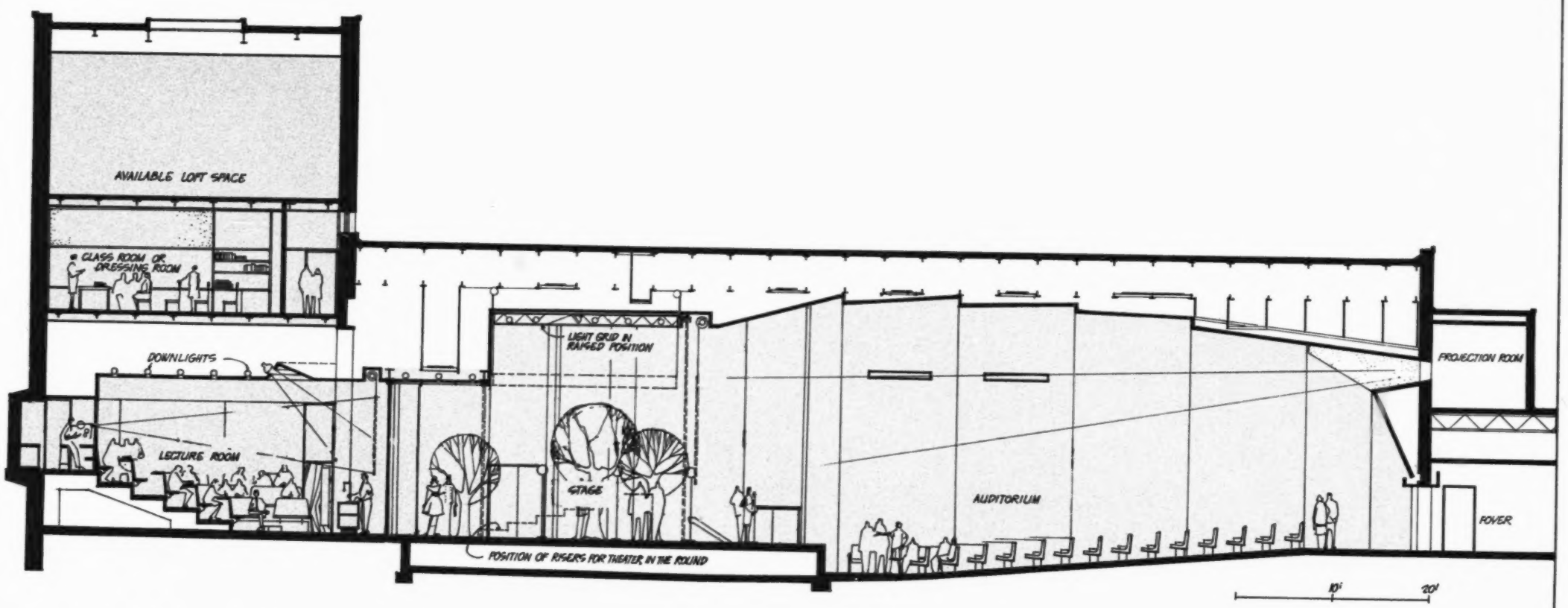
Permissive Space

4

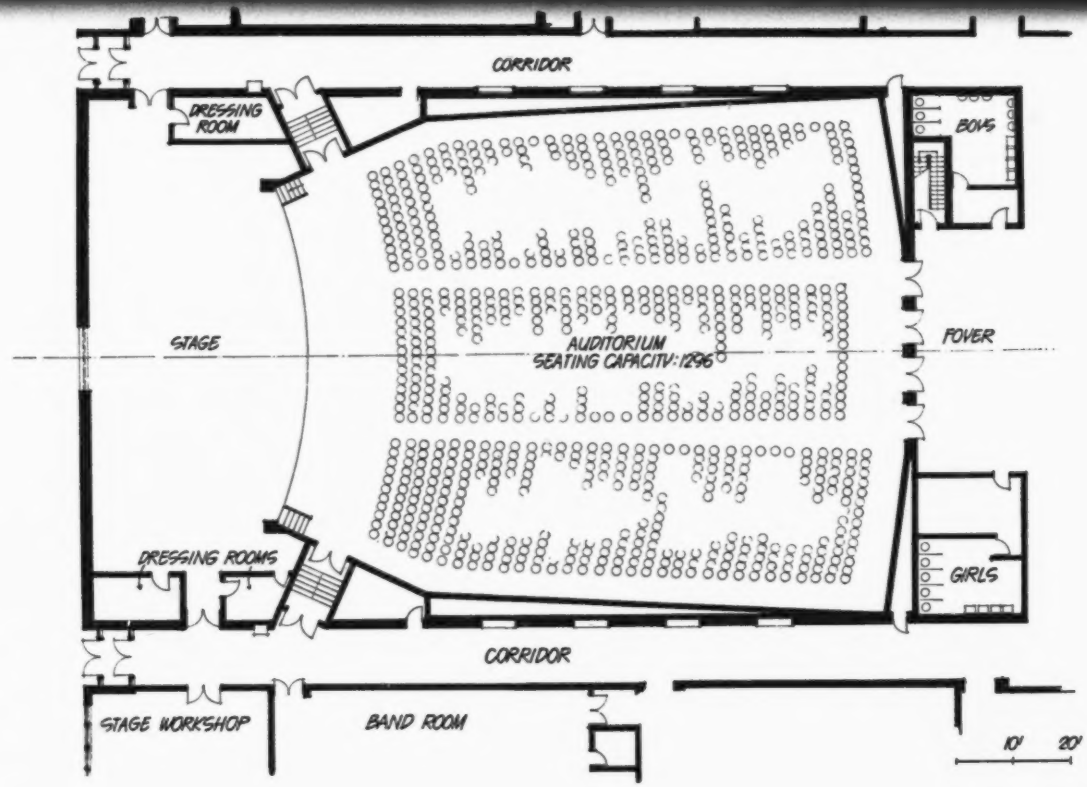


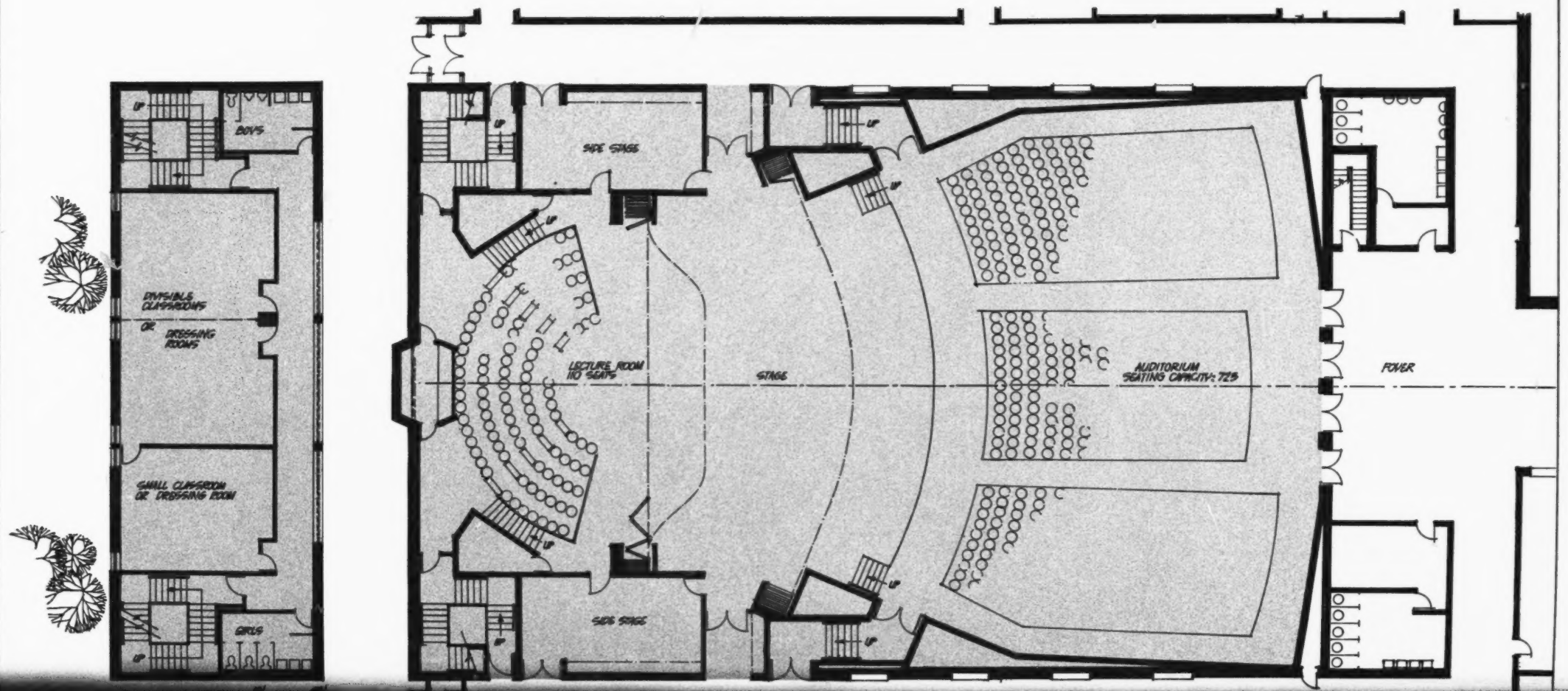
4



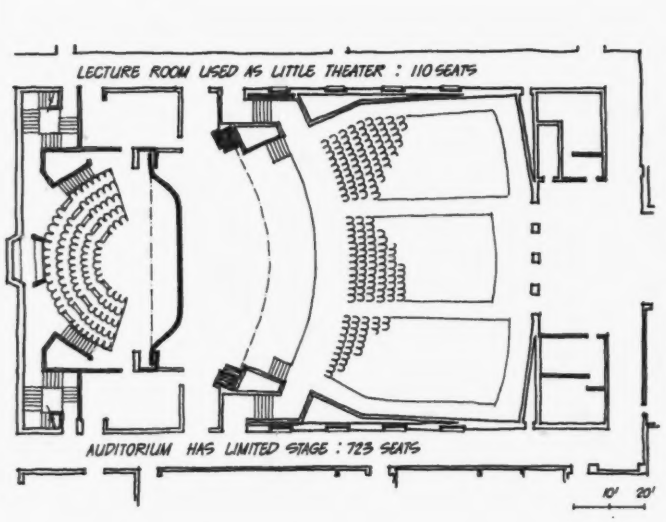


The scenery loft of the old stage is now available for horizontal division by the construction of a floor above the new lecture room. The new space provided can form either two or three classrooms (providing 75 additional teaching spaces) or can be used as dressing rooms. Stage scenery and lights can be supported and hung from a grid ceiling above the new stage. A third floor can be built in the stage loft for a future teacher work area and conference room.

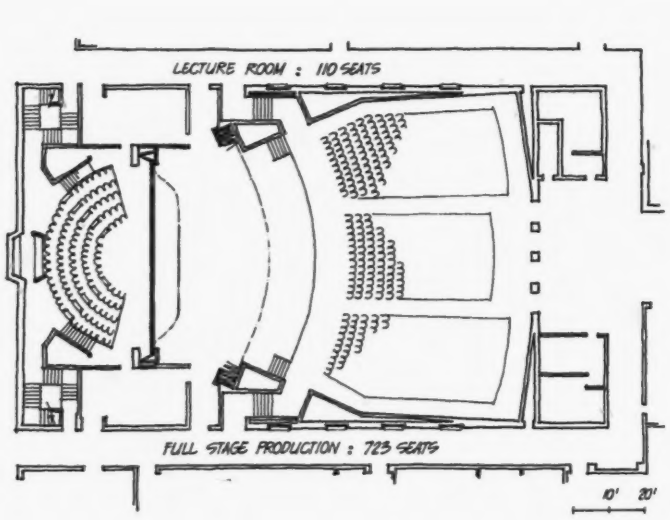

CORRIDOR
DRESSING ROOM
BOYS
STAGE
AUDITORIUM
SEATING CAPACITY: 1296
FOYER
DRESSING ROOMS
GIRLS
CORRIDOR
STAGE WORKSHOP
BAND ROOM
10'
20'


BOYS
DIVISIBLE CLASSROOMS OR DRESSING ROOMS
SMALL CLASSROOM OR DRESSING ROOM
GIRLS
SIDE STAGE
LECTURE ROOM 110 SEATS
STAGE
AUDITORIUM
SEATING CAPACITY: 725
FOYER
SIDE STAGE

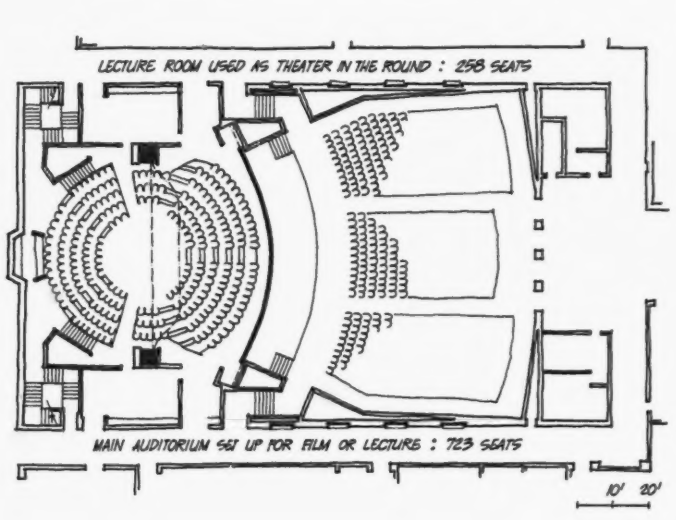
After study of the sight lines in Penn's auditorium, the stage was moved forward far enough to permit a full dramatic performance in front of the old proscenium. The original stage then becomes a fully tiered lecture room, divided from the new stage by a sound-retardant operable partition and equipped with a projection booth and complete conduiting for electronic stations at each of the 110 seats. An additional sound-resistant divider is provided upstage, and the combination of the two operable walls, the main stage, and the lecture room offers a wide variety of teaching and performing opportunities in permissive space.



When the lecture room is used as a little theater, its operable partition flexes back from the semicircle of seats, allowing simultaneous productions on both sides of the partition.



The smaller hall becomes a lecture room when its sound-retardant operable partition is pulled straight across the opening between the two houses. Here, a full stage production is possible in the main auditorium while a lecturer speaks on the other side of the partition.

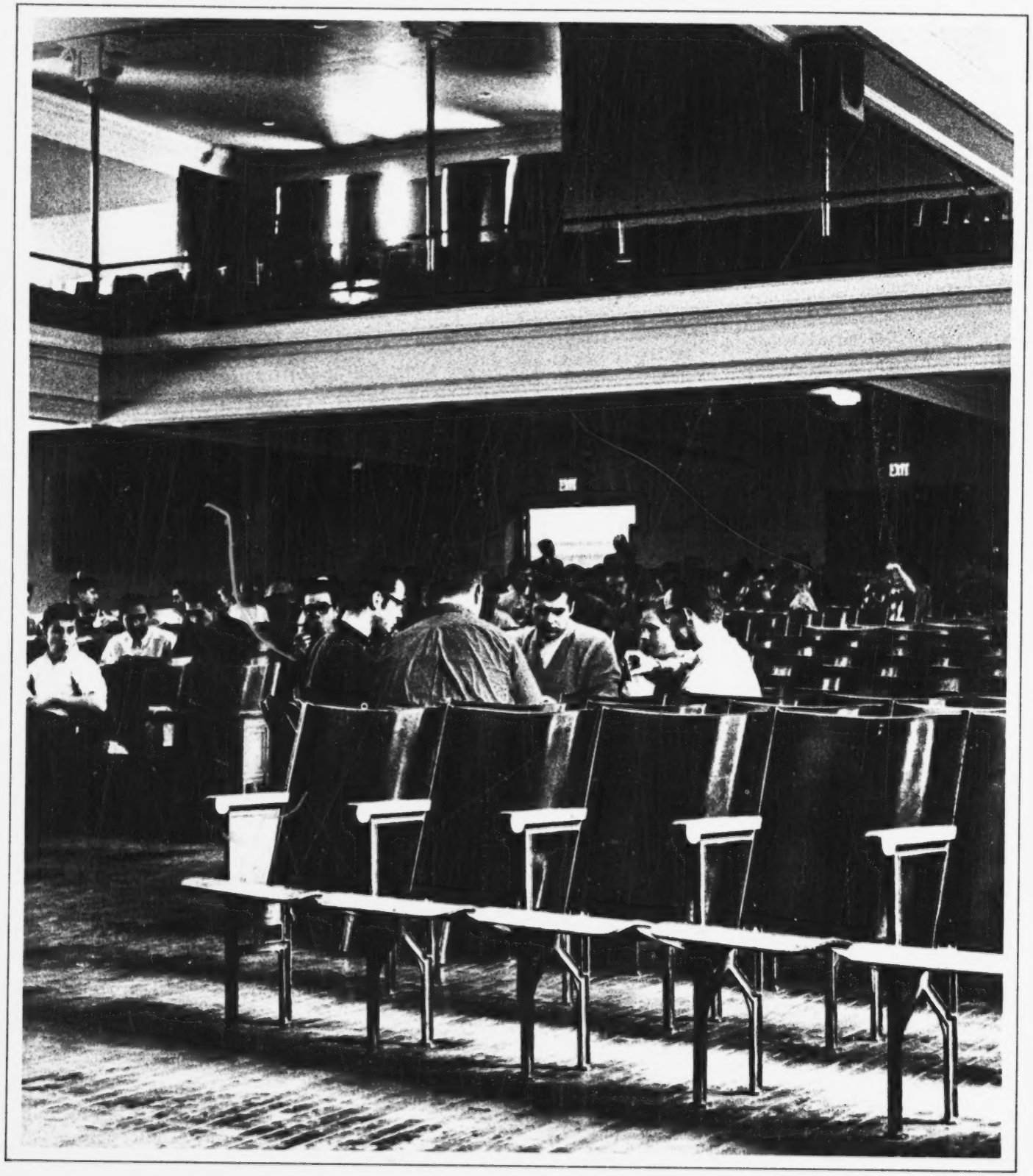


For theater in the round, the lecture room is expanded by the use of the second, larger operable partition. In this case, the larger hall may be employed simultaneously for film or as a lecture room.

Penn High School, Mishawaka, Indiana

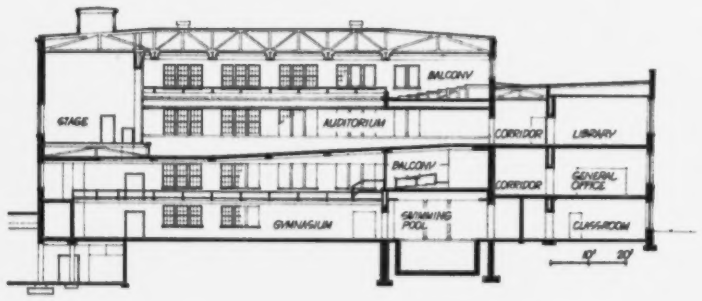
Penn High School in Mishawaka, Indiana, was opened in 1958. Its student body numbers 1,650 and is expected to grow to 1,800. Penn's conventionally designed auditorium seats 1,296, which means that, like many of the halls in this study, it is too small for a mass assembly and too large for instructional purposes. Moreover, the house is too deep for theater, particularly that produced by the students. School administrators at Penn have long felt that the auditorium capacity could be reduced to hold a third of the student body, or one grade level, plus teachers and guests, freeing the remaining area for teaching functions. Plans are already under way to construct an improved library, add a vocational training wing, and convert the present library into classrooms. The number of new classrooms to be built depends upon the number of teaching spaces provided by auditorium remodeling. The study's objectives, then, were reduction of the hall size and provision of as much useful instructional area as possible. Remodeling plans propose a 723-seat auditorium, a 110-seat lecture room that could be used as a little theater or music room; teaching space to accommodate 75 students and double as dressing rooms; and space that could be developed as a teachers' planning center. The space offered by a scenery loft and a conventional auditorium is used to produce two permissive performing areas and highly flexible instructional space. The cost of improvements was estimated at $411,000, as compared to $550,000 for new construction of equivalent effective space for 265 students.

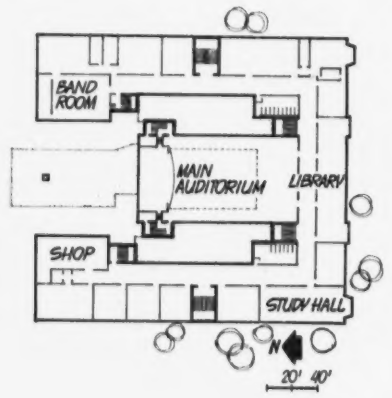
Superintendent, George J. Huys
Principal, Michael Green
Architect for the original structure, Charles W. Cole & Son, Architects and Engineers

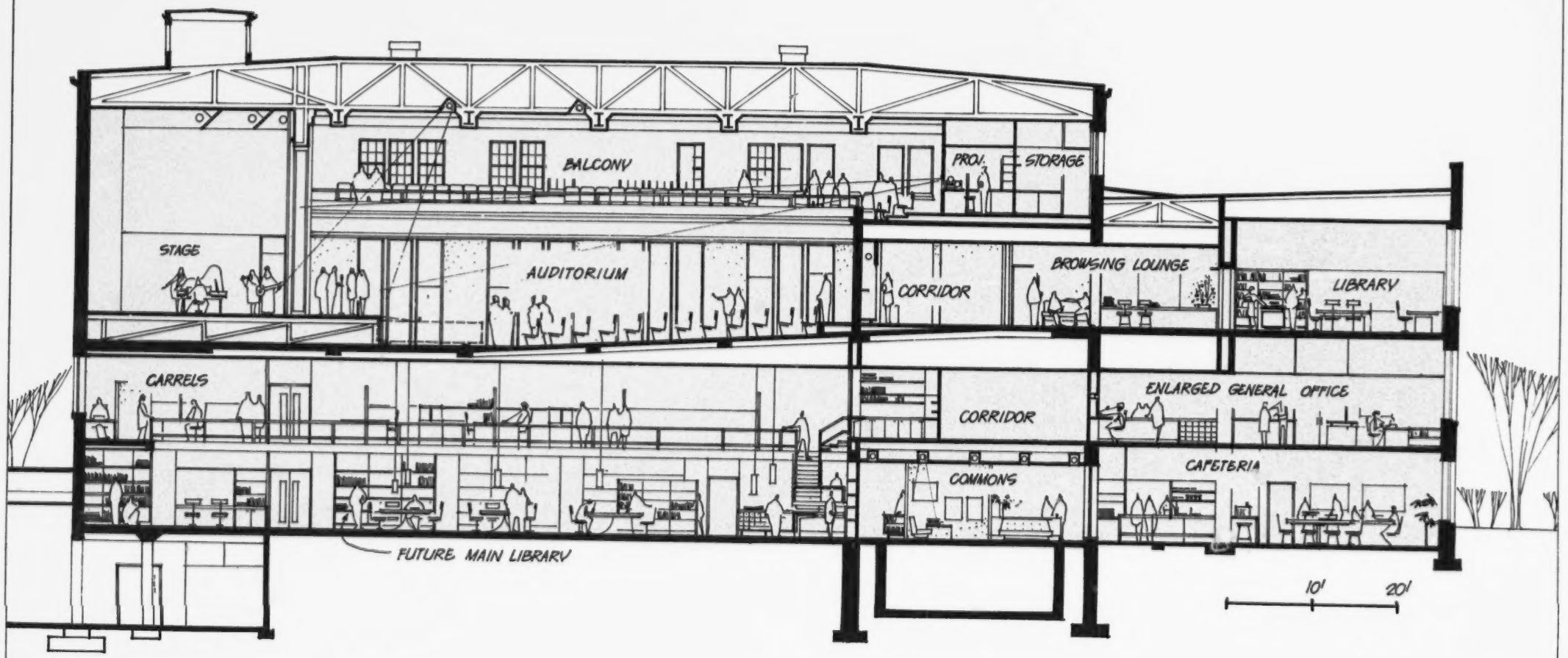


5

Margin for Boldness







After the physical education annex is built and the present gymnasium and swimming pool are relocated, it is proposed that the old pool be

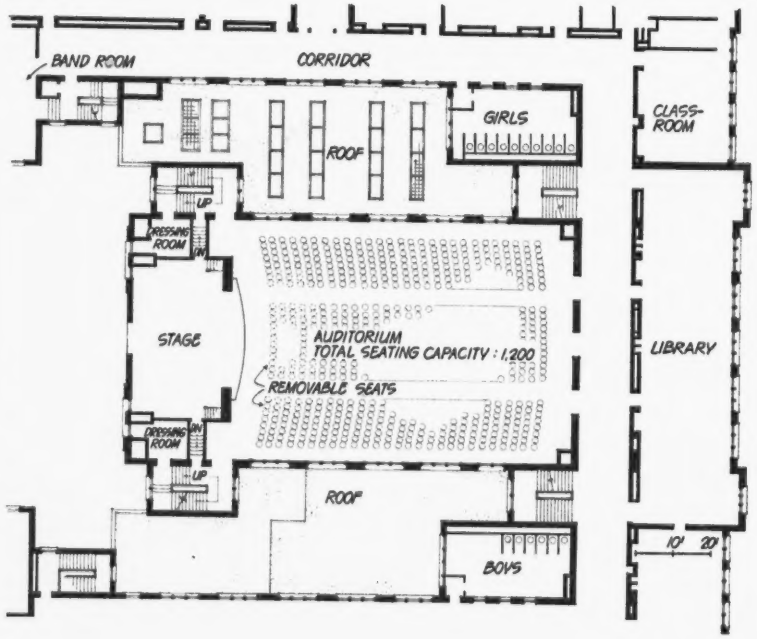
and conference section. The running track balcony is converted for use as individual study space adjacent to a new open stack area. These

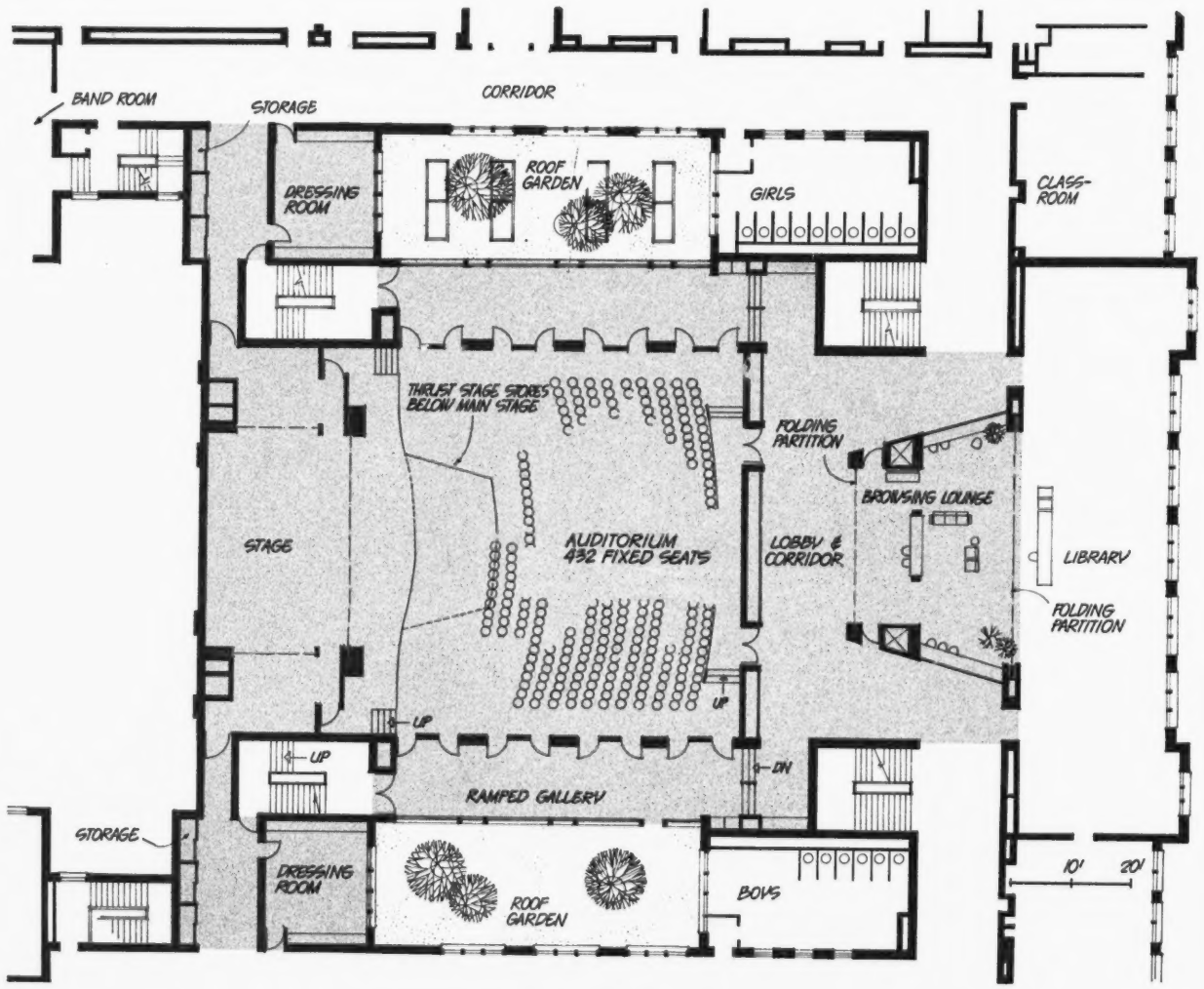
15,000 volumes, individual study spaces for as many as 60 students, and reading areas for 100 more. The lounge area and the old library can

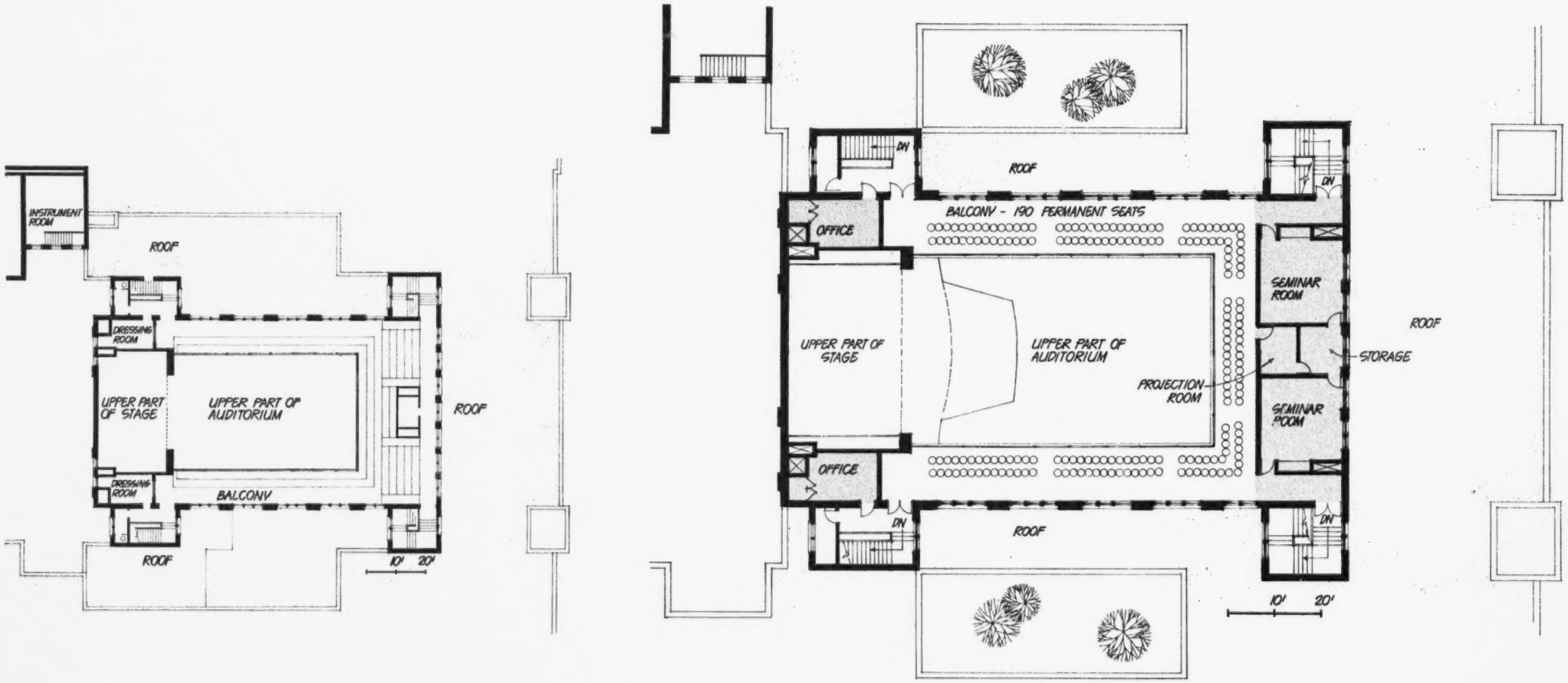
relocated, it is proposed that the old pool be filled in and a library complex be developed in the newly created space. The main floor of the present gym is shown devoted to a reading area

space adjacent to a new open stack area. These changes alone will make a major contribution to the educational strength of Central High School, providing a library that could house

more. The lounge area and the old library can be converted into an excellent language or guidance center. A commons, serving library and cafeteria, is located over the old swimming pool.







Significant improvements in circulation, seating, lighting, and decor are possible without major structural changes to Central High School's auditorium. Through-traffic from the front to the rear of the hall, a difficult journey at present, is provided by converting the existing side light courts into ramped display galleries. New dressing rooms are added at the stage end of each court. Stage access areas are changed to avoid the present dark staircases, with direct connection provided to the main school corridors on each side. Aside from their use for art display, the galleries are an aid in reorganizing the auditorium for continental seating. The number of seats is reduced to accommodate half of the anticipated enrollment, plus teachers and guests. Less desirable seating at the rear of the house, under the balcony, is removed and the space devoted to a browsing lounge connected with the existing library. In the balcony of the auditorium, seating is retained for two rows on all three sides, and seats at the rear are removed to allow conversion of the space into seminar rooms, a projection booth, and a storage area. The existing dressing rooms, obviated by enlarged facilities on the main auditorium level, convert to offices.

Central High School, West Allis, Wisconsin

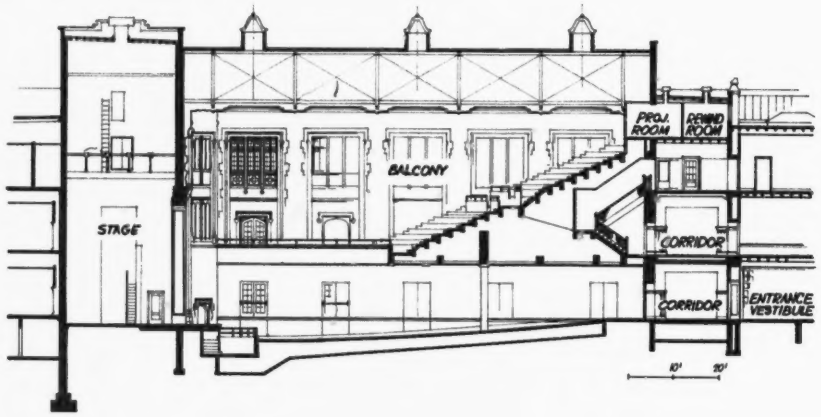
Despite sufficient classroom facilities, West Allis, Wisconsin's 45-year-old Central High School is plagued by the problems of inadequate common use areas. Its library is woefully undersized, and its gymnasium cannot satisfy the needs of the 1,226 students. The overflow from a crowded cafeteria takes up useful instructional space, and the 1,200-seat auditorium, located on the third floor, suffers from inadequate stage facilities, poor traffic circulation, and virtual inaccessibility from the music rooms. Fortunately, a new physical education annex is contemplated to house the gymnasium and swimming pool. Estimated to cost between $950,000 and $1,250,000, it will be constructed across the street from the school.

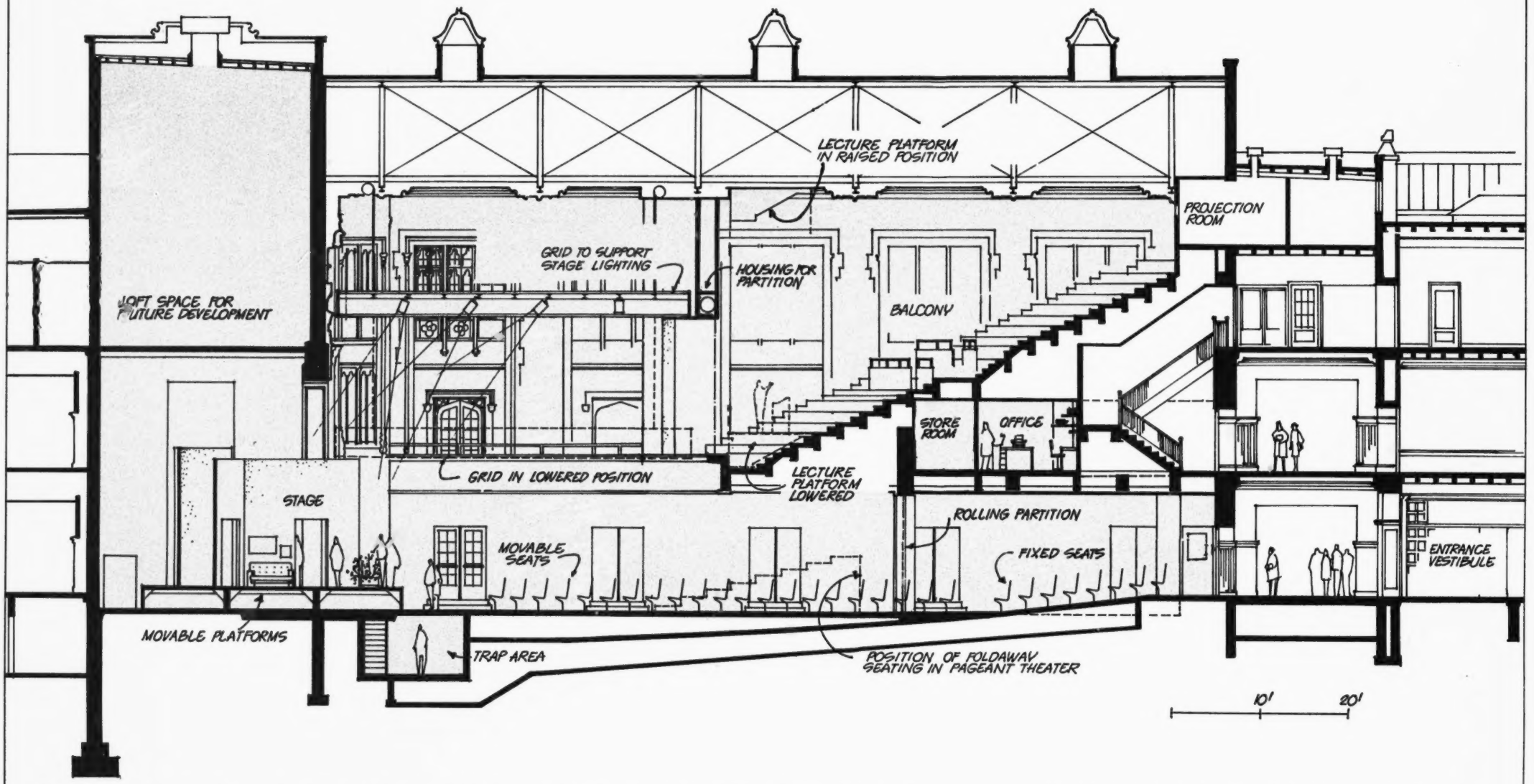
This will free the first and second levels of Central's present building for modification, and opens the way for study of all the common use areas. In this proposal, a new library with browsing, reading, and study areas, as well as a large reference section; a new cafeteria with an adjacent student commons area; enlarged office spaces; two seminar rooms; and a much-improved auditorium are all achieved, as engineering consultants reported, "with a minimum of difficulty." The cost of renovation, including air conditioning, lighting, and plumbing, is estimated at $780,000, whereas a new building adequate for 600 students (the existing common use areas are estimated to be adequate for only 800 students) would cost $1,360,000, plus the expense of buying land and equipping and operating two separate school plants. There appears to be a clear margin of advantage in undertaking a bold program of remodeling for Central High School.

Superintendent, E. G. Kellogg
Principal, L. A. Szudy
Architect for the original structure, Robert H. Messmer & Brothers

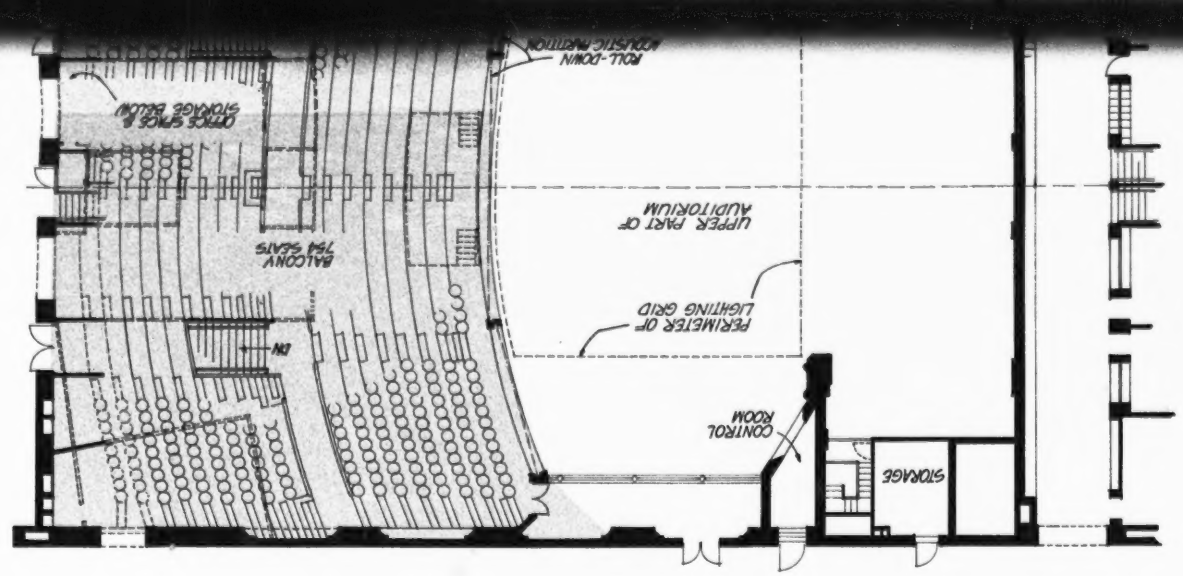
Toward a New Drama

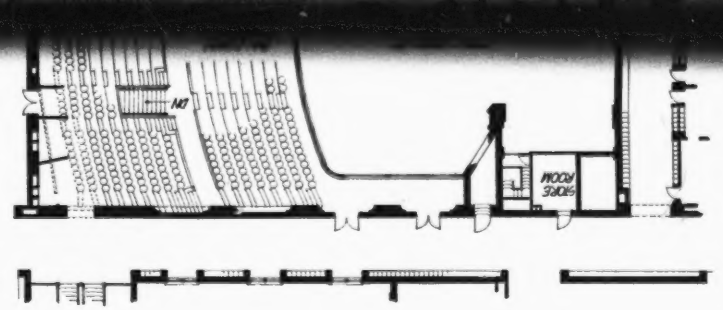
6

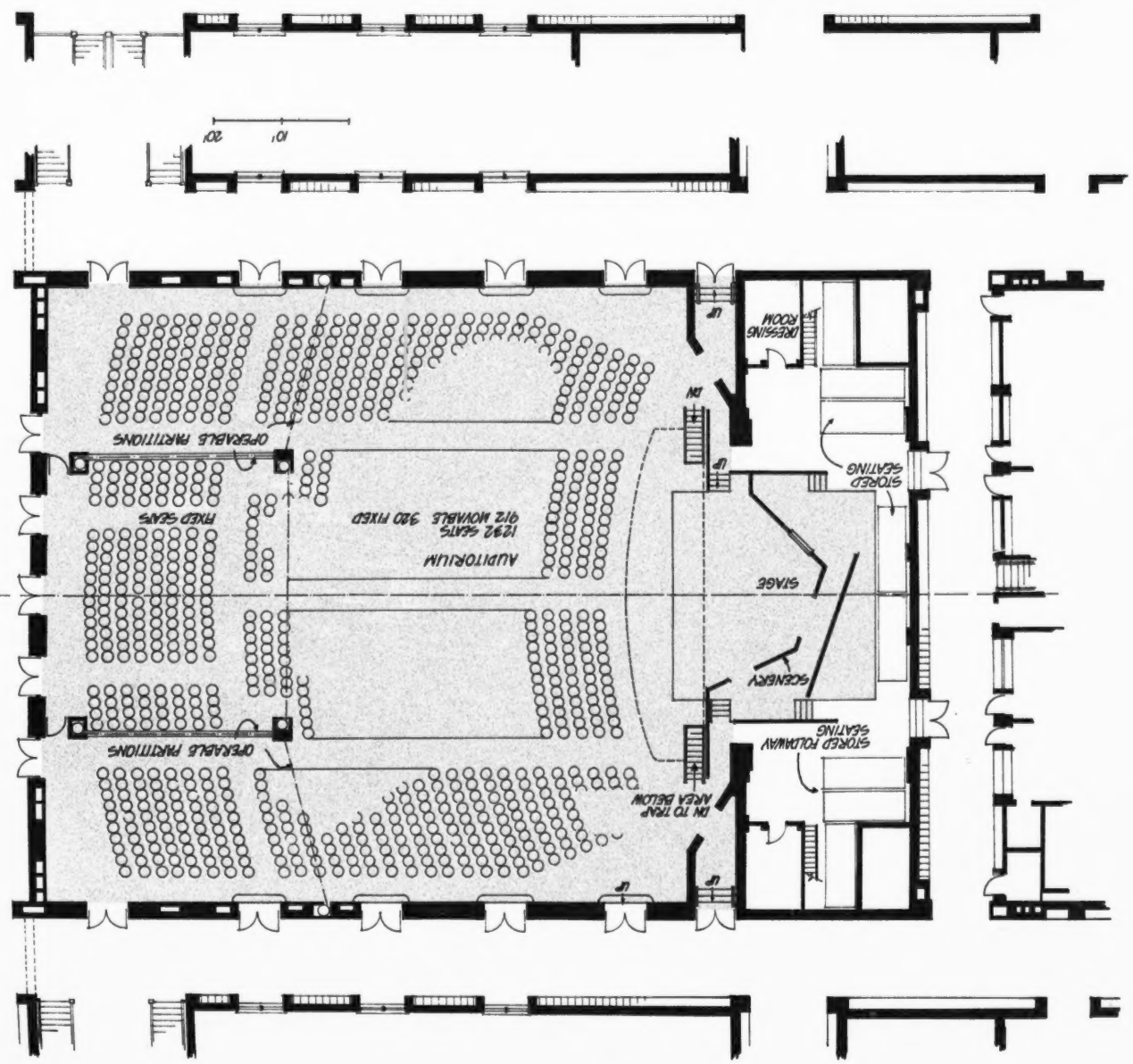


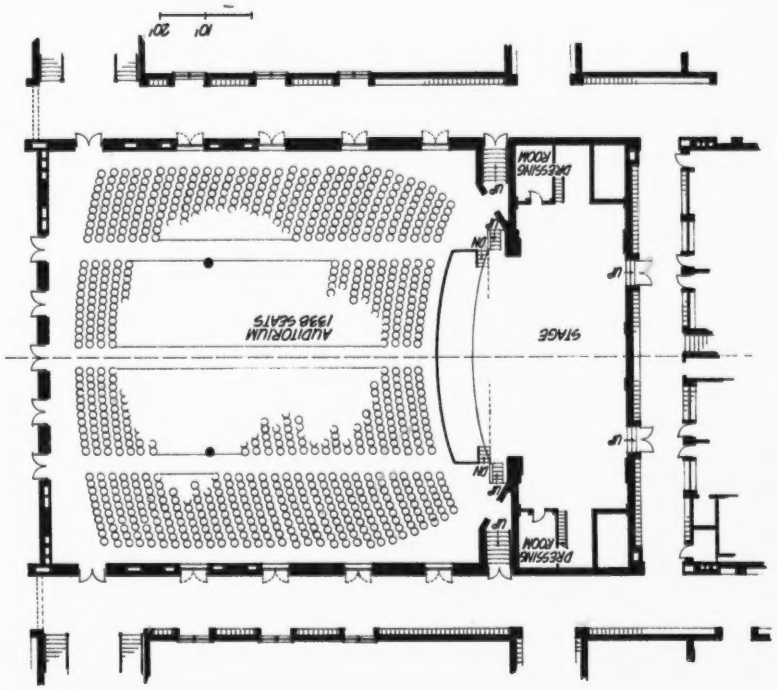


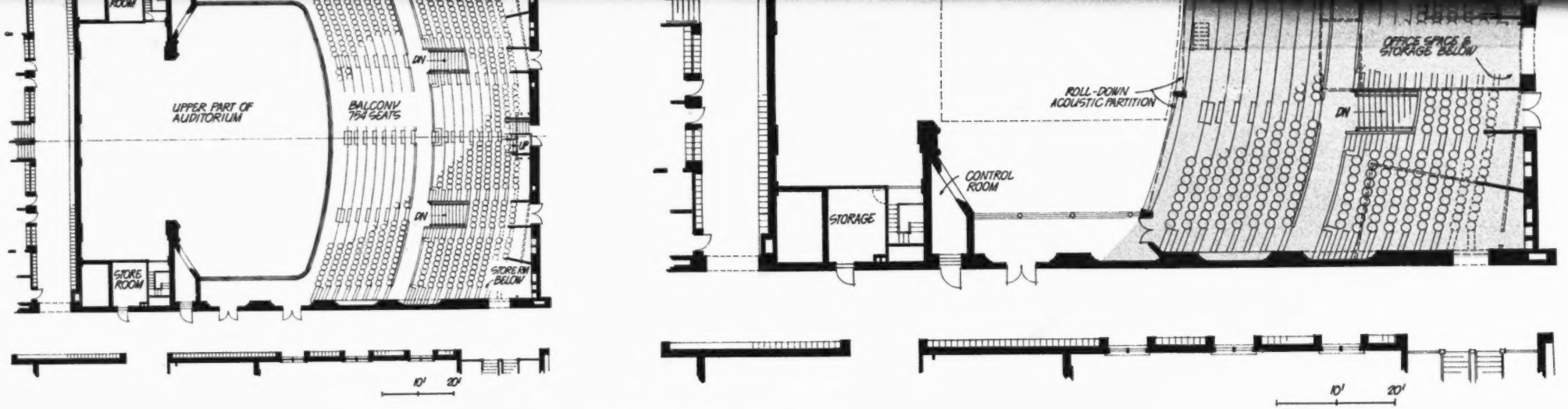
On the auditorium's main level, the new flat floor is supported by dwarf walls built up from the existing slope. All existing seating on the main level is replaced by upholstered auditorium chairs. The rows under the balcony are fixed, but all others are movable to allow a variety of stage and seating arrangements. The permanent house lighting is changed for narrow-spread downlights, designed to provide adequate illumination for note-taking without washing out movie and slide projection images. Stage lighting is completely renovated.


ROLL-DOWN ACOUSTIC PARTITION
OFFICE SPACE & STORAGE BELOW
BALCONY 764 SEATS
UPPER PART OF AUDITORIUM
PERIMETER OF LIGHTING GRID
DN
CONTROL ROOM
STORAGE


DN
SHOPE ROOM


10'
20'
DRESSING ROOM
UP
DN
OPERABLE PARTITIONS
AUDITORIUM
1292 SEATS
912 MOVABLE 380 FIXED
FIXED SEATS
STORED SEATING
STAGE
SCENERY
STORED FOLDAWAY SEATING
DN TO TRAP AREA BELOW


10'
20'
DRESSING ROOM
AUDITORIUM
1398 SEATS
STAGE
DRESSING ROOM
UP
DN



Because its front row is gently curved, roll-down acoustical curtains can be used to separate the balcony from the main auditorium in Des Moines' Roosevelt High School. Under these circumstances, the area becomes a large lecture hall, using a removable speaker's platform. Likewise, the space beneath the balcony can be walled off from the main hall and separated into two 80-seat classrooms and one 160-seat lecture hall by employing sound-retardant operable partitions.

The basic auditorium area is left available for completely free utilization of movable stage and seats. Unobstructed by chairs, the flat floor itself can be used for anything from a gymnasium to a dance studio. If foldaway seats are installed on three sides and on the existing stage, the flat floor becomes an arena for spectator functions.

Elizabethan theater on a projected platform is made possible by rolling the stage in front of the proscenium and rearranging the seats to surround it. In this instance, the existing backstage area becomes available for dressing rooms, located behind the backdrop.

When the platform is rolled partly past the proscenium, other platforms connected to it, and the seats arranged in an arc around the complex, thrust staging is made possible. Here, the backstage area is available for the use of rear projection equipment.

Roosevelt High School, Des Moines, Iowa

Superintendent, Dwight M. Davis
Principal, Charles Rowley
Architect for the original structure, Proudfoot, Bird, & Rowson

To demonstrate the ways in which alternate plans and ideas might be applied in the same space, the auditorium of Des Moines' 43-year-old Roosevelt High School is considered here to be essentially identical to that of St. Louis' Roosevelt High School. The modifications proposed for one can be appropriated, in whole or in part, for the other.

Since fixed seating contributes most to inflexibility, the Des Moines study shows a large portion of the hall's 2,092 permanent seats removed, allowing leveling of its sloped floor and freeing the auditorium for a multiplicity of uses, educational as well as theatrical. While the modifications shown here are simple and inexpensive, they result in opportunities for a wide range of striking variations. No new spaces were planned in the study, so no comparison between it and the construction of equivalent additions is possible. However, it is estimated that modification of either of the Roosevelt High Schools along the lines suggested would cost $190,000.

Board of Directors

MILTON C. MUMFORD, *Chairman*
Chairman of the Board, Lever Brothers Company

ALVIN C. EURICH, *Vice Chairman*
President, Aspen Institute for Humanistic Studies

CLAY P. BEDFORD
President, Kaiser Aerospace & Electronics

JAMES C. DOWNS, JR.
Chairman of the Board, Real Estate Research Corporation

HENRY DREYFUSS
Henry Dreyfuss & Associates

MORRIS DUANE
Attorney, Duane, Morris and Heckscher

HAROLD B. GORES
President, Educational Facilities Laboratories

FREDERICK L. HOVDE
President, Purdue University

J. E. JONSSON
Chairman of the Board, Texas Instruments, Inc.

PHILIP M. KLUTZNICK
Klutznick Enterprises

J. L. MORRILL
Consultant, The Ford Foundation

WINTHROP ROCKEFELLER
Governor, State of Arkansas

THOMAS J. WATSON, JR.
Chairman of the Board,
International Business Machines Corporation

BENJAMIN C. WILLIS
Educational Consultant
(formerly General Superintendent of Schools, Chicago, Illinois)

Officers

HAROLD B. GORES, *President*
JONATHAN KING, *Secretary and Treasurer*

Staff

HUGH BECKWITH, *Consultant*
LILLIAN BUTLER, *Publications Associate*
ROBERT M. DILLON, *AIA, Consultant*
MARGARET FARMER, *Editorial Associate*
JAMES J. MORISSEAU, *Editorial Associate*
VAN H. SAVELL, *Editorial Assistant*
CLIFFORD WALSH, *Assistant Treasurer*
RUTH WEINSTOCK, *Research Associate*

Educational Facilities Laboratories, Inc. is a nonprofit corporation established by the Ford Foundation to help schools and colleges in the United States and Canada with their physical problems by the encouragement of research and experimentation and the dissemination of knowledge regarding educational facilities.

Acknowledgements

Original report by F. Philip Brotherton, Partner-in-Charge,
The Perkins & Will Partnership

Written by Sherwood Kohn

Director of the project Ronald W. Haase,
Ronald W. Haase and Associates, Architects,
formerly Architectural Associate, EFL

Architectural drawings by Julie Maser,
formerly of The Perkins & Will Partnership

Rochester Central model by Eugene F. Chilelli of
William T. Ottawas & Sons

Photograph on page 4 by George Zimbel

Photographs of model by Jonathan King

All other photographs by Ted Williams

Designed by Sutter and Wartik Graphic Design, Inc.

Printed by Sanders Printing Corporation

Additional copies are available from the offices of
Educational Facilities Laboratories
477 Madison Avenue
New York, New York 10022

Library of Congress Catalog No. 67-19966

First Printing: February, 1967

Foreword

One of the least used and least useful resources in thousands of old and middle-aged schools in the United States and Canada is the auditorium. Usually scaled for an all-school assembly that either doesn't or shouldn't take place, these cavernous facilities often sit unused or underused most of the school year.

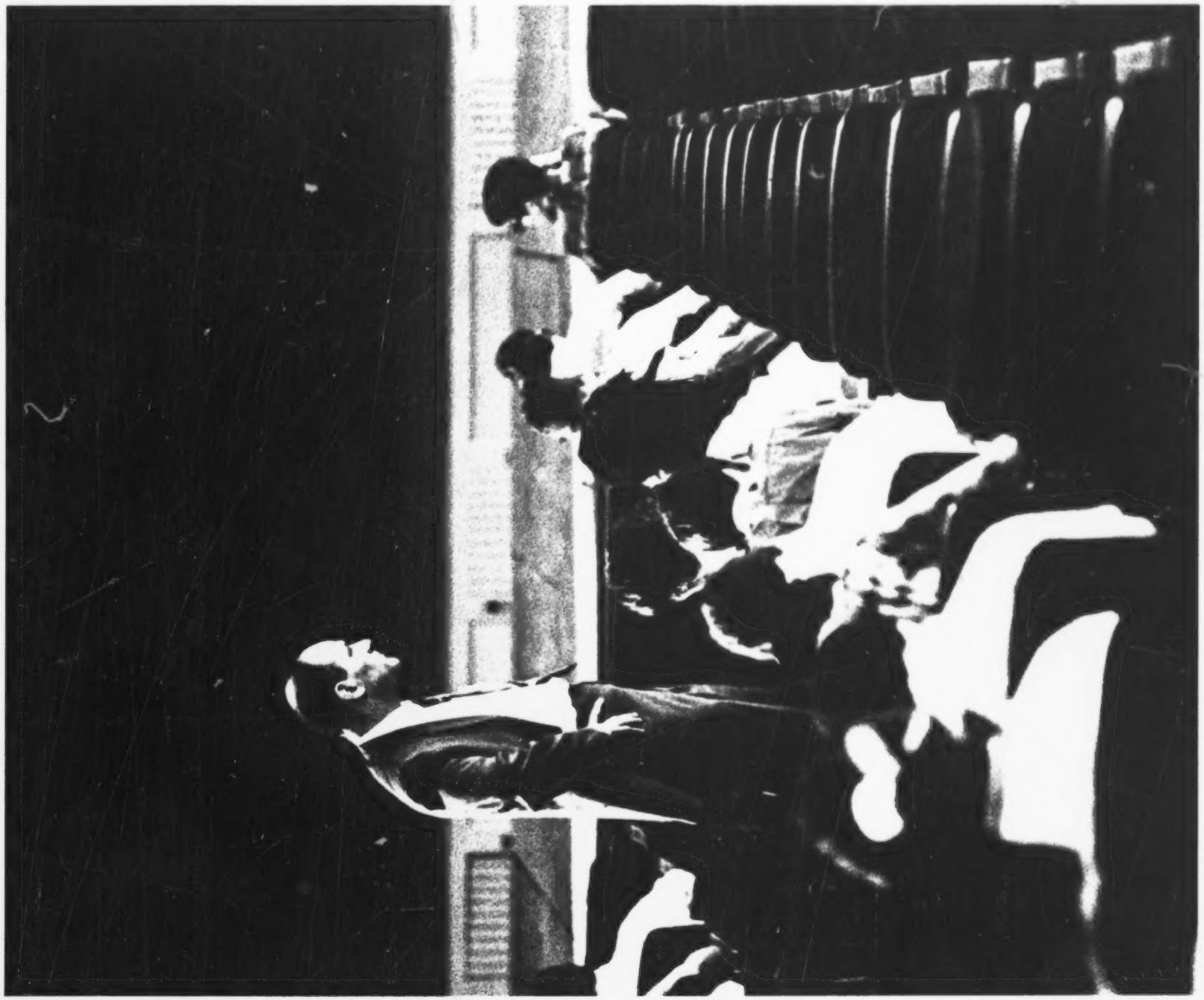
This report is the result of an EFL self-administered project designed to pull together a talented and knowledgeable group of educators, architects, and engineers, as well as acoustical and theater consultants to see if these spaces could not be put to better use through creative remodeling within the fiscal resources of typical school districts.

The conclusions which follow are in the form of a group of case studies of real auditoriums in existing schools. While in each case the proposed remodeling is based on the individual school's program and the realities of the existing space, some generalizations have clearly emerged.

With careful planning, it is possible to use these white elephants to provide many of the facilities which are important for contemporary educational, dramatic, and music programs. Indeed, these nonclassroom spaces can be produced at costs considerably below those required for building additions to accommodate the same programs or student population increases.

None of these plans can be transplanted directly into other schools, but the concepts, principles, and techniques which underlie these projects can be used to make many older schools—too good to discard and not good enough for today's education—into better places educationally. And this can be done at costs sufficiently below new construction costs to please the taxpayers in communities where educational aspirations are higher than fiscal resources.

Educational Facilities Laboratories



Introduction

Beginning with the latter half of this century, the effects of the great population explosion that followed World War II were felt throughout America's complex socioeconomic structure. At the moment, they are, and seem likely to continue to be, highly pervasive. But nowhere have these forces been felt more acutely than in the nation's schools. Student enrollments in both urban and suburban areas are expanding far beyond educational facilities that were considered adequate a score of years ago.

Increasingly, school administrators are faced with the problem of providing more space at a minimum of taxpayers' expense. Under the pressures of urban concentration and mounting property costs, it is often impossible or uneconomic to acquire additional land for the construction of school annexes. Rising construction costs, coupled with a demand for advanced technical resources and teaching methods, have added further burdens to almost every education budget. In the context of these conditions, common sense

alone demands an assessment of the adaptability of all good existing school structures before building new ones.

To take a close look at a representative sampling of schools caught in the expansion squeeze, Educational Facilities Laboratories assembled a team of architects, planning consultants, and imaginative school administrators who were asked to study the problems and recommend solutions that were at once practical and boldly innovative.

Upon examination of the six buildings chosen for this study, it was quickly apparent that school needs had changed considerably since the plants were constructed. Burgeoning enrollments, new educational techniques, and expanding curricula have combined with many other factors to exert undeniable constraints, not only in favor of basic instructional space, but also for specialized work, study, and storage areas as well. Heading the list of requirements that have grown as a result of increasingly complex and expanded academic programs were large-group instruction areas with adjacent faculty planning space, conference and seminar rooms, and larger and more numerous resource storage areas, both for books and audio-visual materials.

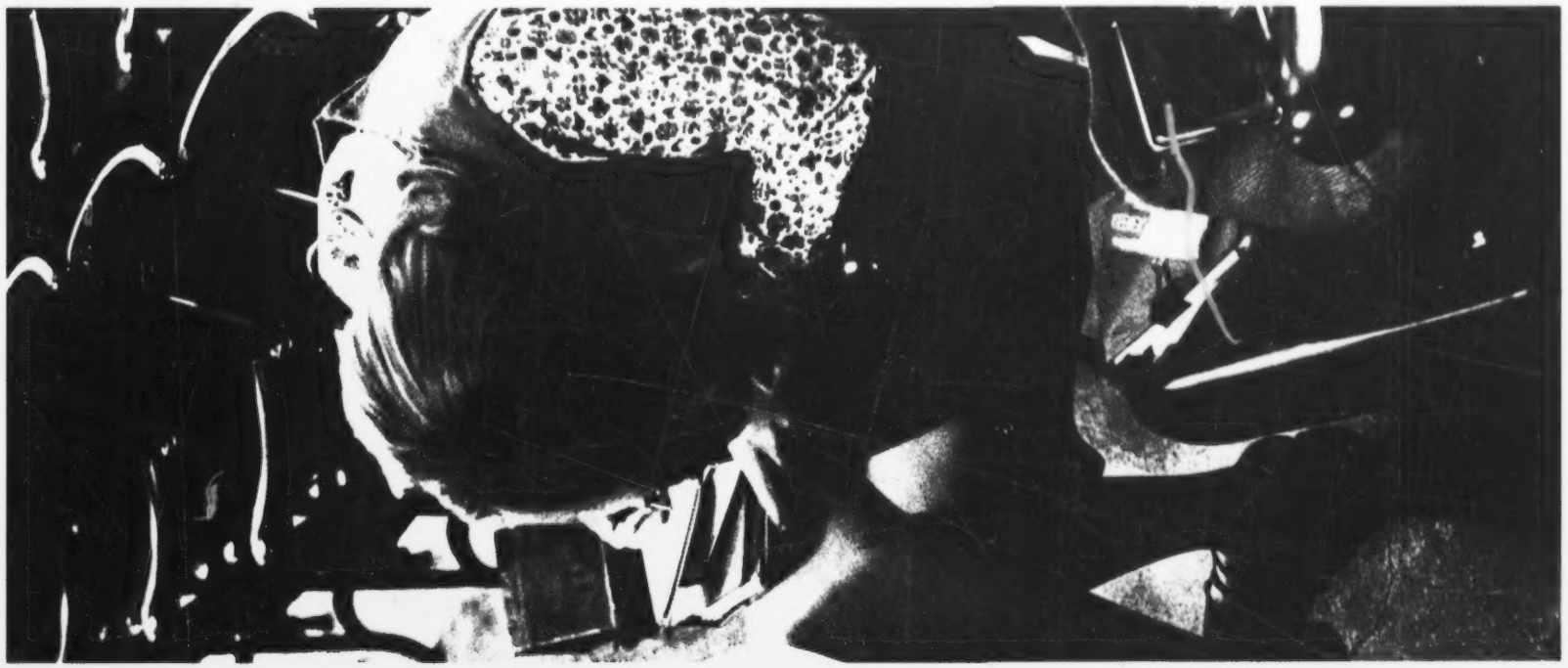
Libraries, in particular, were found to have outgrown their original functions. The modern school library has ceased to be "the room at the end of the hall," and has assumed the role of a thriving instructional materials center, employing the full spectrum of informational media. Basically, the book storage requirement has increased, but the addition of facilities for tape, filmstrips, records, microfilm, modern retrieval systems, and special listening and viewing devices has contributed to the obsolescence of all but the most pliable of school libraries. The new library has become the hub of curricular enterprise, and it is now felt that any expansion or conversion study should assume that such a valuable facility is the center of the living school, helping by its atmosphere, activity, and location to create and encourage a spirit of independent learning.

In Search of Space

In the course of this study, it was discovered that many older schools, and even some of more recent vintage, harbor a substantial amount of unused space that could be better and more economically employed to handle the expanding needs of curricula, staff, and student body.

One of the greatest space-wasters is the large, conventionally designed auditorium, originally built to accommodate an entire student body at one sitting, but now awkward and inefficient in its ill-suited roles of study hall, meeting place, lunchroom, and conference area. Most of these cavernous halls are inadequately equipped, improperly lighted, and much too large for either instructional or assembly purposes. Consequently, many lie idle during a major portion of the school year.

This study then focused on exploring design ideas, in representative situations, for the retrieval of space from six partially dormant auditoriums, and for the conversion of this space to library, classroom, lecture hall, office, cafeteria, work area, and other uses that could more judiciously benefit the changing educational program. Simultaneously, auditorium space was also pared down to more effective size for such traditional functions as assemblies and theatrical and musical performances by the student body.



A reasonable range of problems and solutions are presented and discussed in the following case studies. Every aspect of the school auditorium, from heating, lighting, and acoustics to all the sacred cows of community pride and tradition, is affected. In this report attention was limited to auditoriums and those spaces immediately supporting them, but it is recommended that a broad approach to renewal considerations be taken, involving the total school.

There was sufficient evidence discovered in this study to support the conclusion that the bolder and more imaginative the concept of change, and the broader the base upon which it is planned, the more rewarding will be the effects, educationally and financially.

In each case, the architectural proposals have been designed to show the impact of imagination on previously unproductive space. It may be difficult, however, for some schools to finance more than a small demonstration of feasible space retrieval. In these cases, while over-conservatism is undesirable, a short first step may prompt further action.

In Pursuit of Reason

The solutions undertaken were examined thoroughly to insure their reasonableness and feasibility. Each proposal was carefully reviewed by structural, mechanical, and electrical engineers. Special architectural and educational consultants have, after examination of each space, provided guidelines for modification and improvement. Details are not intended to be sufficient for construction purposes, but only to demonstrate a line of attack.

Obviously, many problems, apart from the structural requirements, are created by space subdivision, but it has been most gratifying to find that only minor adjustments were necessary to correct most difficulties. Among other things, the studies indicated clearly that there are no obstacles that cannot be circumvented by a creative approach.

Moreover, cost estimates have shown that real economies can result from the conversion of auditoriums that presently lie sadly underused. Even in cases where land was available for new construction, the cost of remodeling was lower than the cost of a new building. In the studies, cost figures are directly related to additional student capacity, new usable space, or both. It can be argued that any increases in operating and maintenance costs are more than reasonable in light of the higher enrollment or degree of space utilization which is made possible.

Of course, the problems of scheduling alterations around school operation must be computed against a background of favorable costs. Sensible staging of a major remodeling, as well as the erection of carefully placed temporary walls, can allow uninterrupted education, and the dirtiest and noisiest operations can be accomplished during summer vacation; finishing can be left for periods when school is in session.

Many doubts concerning the advantages of auditorium conversion have evaporated during the preparation of this report. In the course of the study, it was concluded that remodeling approaches like the ones illustrated can extend the useful lives of school buildings, increase their capacities, and improve their ability to adapt to new developments in education. EFL is convinced that every auditorium deserves a fair shake.

Special Considerations

School remodeling poses special problems, and when the changes center around school auditoriums, the problems become even more complex. In another sense, however, the effects of an auditorium conversion program radiate throughout a school, psychologically as well as physically, and often extend into the community outside. Here, three experts writing on important aspects of school design and space retrieval lay down guidelines for stage design, acoustics, and audio-visual teaching devices that affect not only education but art, drama, music, and a wide range of educational and human considerations.

ACOUSTICS IN REMODELED AUDITORIUMS

RANGER FARRELL, a partner in the consulting firm of Ranger Farrell & Associates, of Tarrytown, N.Y., is assistant professor of architecture at Cooper Union and a visiting critic and lecturer on acoustics at the Parsons School of Design. A graduate of the Massachusetts Institute of Technology, he has served as senior consultant for the firm of Bolt, Beranek & Newman, Inc., acoustical consultants for the Philharmonic Hall in New York's Lincoln Center for the Performing Arts, and has written extensively on acoustics for leading architectural journals.

AUDIO-VISUAL CONSIDERATIONS

MORTON C. GASSMAN, associate professor of architecture and senior design coordinator at Rensselaer Polytechnic's Center for Architectural Research, holds a B.S. in architecture from the University of Cincinnati and a master's degree from the Cranbrook Academy of Art, and has served as a consultant in audio-visual facilities planning and development for the State University of New York. His published works include "New Spaces for Learning," a 1961 report to Educational Facilities Laboratories, and "Educational Facilities with New Media," an interim report to the U.S. Office of Education.

STAGE DESIGN

JAMES HULL MILLER became interested in the theater during his undergraduate years at Princeton, where he majored in literature and philosophy. Since then, he has designed more than 16 theaters and auditoriums, taught at the University of New Mexico and the Centenary College of Louisiana, and founded the Arts Lab in Shreveport, Louisiana, for the study of stagecraft and the design of open stage theaters. Now a theater design consultant who makes his home in Shreveport, Mr. Miller works in both educational and professional planning and has contributed articles to professional publications.

Acoustics in Remodeled Auditoriums

by Ranger Farrell

One of the most useful acoustic features of an auditorium is its ceiling. Properly shaped, the ceiling becomes a "mirror" that reflects and enforces a speaker's voice. Obviously, an acoustically absorptive ceiling in an auditorium is anathema. While some acoustic tile may be needed, most auditorium ceilings should be composed largely of such sound-reflecting material as plaster, plasterboard, or wood.

If a room has a large volume and its surfaces are predominantly reflective, sounds produced in it will have a long reverberation time.* But a long reverberation time is suitable only for choral and orchestral performances. A short reverberation time—something like 1 to 1.3 seconds—is more desirable for speech, drama, and small ensembles.

Echoes are a common problem. An echo is reflection heard about 70/1000 of a second or more after the original sound has reached the listener's ear. In its mildest form, an echo is heard as a definite repetition of impulsive sounds. If the back wall of an auditorium is concave, echo severity increases. The curve focuses reflected sound energy. When the rear wall is broken up by large diffusing elements such as balconies and projection booths, the echo's severity decreases, and if efficient sound-absorbing materials are applied to the wall, it decreases even more.

In wide auditoriums, a special kind of reflection called a "side wall" echo may become troublesome. This type of echo occurs when a performer speaks from a side extremity of the stage. If the opposite side wall is 35 or 40 feet from him, the performer, as well as many members of the audience nearby, may hear a disturbing echo reflected from it. The side wall echo can be remedied by sharply splaying the front walls of the auditorium like a megaphone, or by narrowing the stage.

One of the great deficiencies of many older auditoriums is a long, low balcony arrangement, which broods over cavernous spaces and from which audiences can see and hear only half of what takes place onstage. When this condition exists, first consideration should be given to allocating such limited spaces to other functions—permanently. An excellent solution of the problem was undertaken in the proposals for St. Louis' Roosevelt High School. There, a new floor at the level of the balcony's bottom row entirely eliminates the overhang problem and places a smaller audience in seats with better-than-average sight lines and better-than-average hearing conditions.

Under proper acoustic control conditions, it should seldom be necessary to amplify speech for audiences of less than 400. But a loudspeaker system should be included in every audience room, regardless of size, if for no other purpose than music and film sound reproduction. When the room is designed to accommodate 400 or more, the system should be planned for speech reinforcement as well. In rooms holding 1,000 or more, with even the greatest care given to acoustic treatment, high quality speech reinforcement must certainly be installed.

For either speech reinforcement or music reproduction, all equipment should be of broad-

**Reverberation time is the time required for a sound to decay to one-millionth of its original intensity.*

cast quality. Control equipment must be located near the back of the room and within the coverage patterns of the loudspeakers. Ideally, a loudspeaker should be located directly above the lecturer or performer. This implies a single speaker at the center of the proscenium arch. Where this is impractical, column loudspeakers may be mounted on each side of the proscenium. Under all circumstances, auditorium loudspeaker systems should be kept separate from school paging networks. The qualities of the systems are always of entirely different orders.

Sound transmission through doors is a perennial problem in all auditoriums, but division of such spaces into various kinds of activity areas introduces a multiplicity of potential noise sources. Thoughtful planning can often resolve many of these problems. For example, in St. Louis' Roosevelt High School, the ramps can be used as sound locks, with conventional doors at either end, thus isolating the commons and corridors from the new lecture rooms.

The most effective way of solving door sound-transmission problems is to use two doors or pairs of doors "in series." These can be hung back to back on a common frame, an expedient that is compact but awkward, or spaced apart to form a sound and light lock.

The noise of feet moving in classrooms, corridors, or gymnasiums also poses a common problem. In remodeling programs, only quiet activities should be planned for spaces above large audience rooms. Wherever possible, recreation rooms should be located on lower levels, preferably on grade. In St. Louis' Roosevelt High School, where the new auditorium is placed over a lecture center, dancers or actors on the stage may find they disturb students beneath. There, both the permanent and semi-circular stages should be of heavy construction and mounted on systems of spring and rubber vibration isolators. In addition, the new structural floor should be of relatively massive, concrete construction. And, finally, consideration should be given to the installation of resiliently suspended plaster soffits between the beams. In less critical situations, such as the aisles on the new flat floor of the Des Moines' Roosevelt High School auditorium, areas can be carpeted to reduce noise at its source.

Excessive mechanical equipment noise is another frequently encountered problem in audience rooms. Fan noise transmitted into an auditorium through air ducts can usually be reduced by linings or mufflers in the ducts. Air turbulence at supply diffusers often creates disturbing noises, and the only solution is more or larger diffusers. Vibration transmitted through roof and ceiling and reradiated into a room as noise can be stopped by locating the offending equipment on springs and carefully isolating piping and electrical conduit to assure a minimum of physical linkage to the building structure.

Almost invariably, remodeling offers a major advantage over new construction in the matter of mechanical noise control. Before remodeling, existing machinery noise can be measured, whereas it is difficult to predict the precise effects of mechanisms prior to installation. If existing equipment is to be integrated into the remodeling program, and if it is audible, the sound should be measured and compared with criteria for acceptable auditorium noise levels.

If new equipment is planned, all normal precautions of good acoustical engineering practice should be applied. In planning, always consider the fact that distance is a great healer. Equipment should not, unless absolutely necessary,

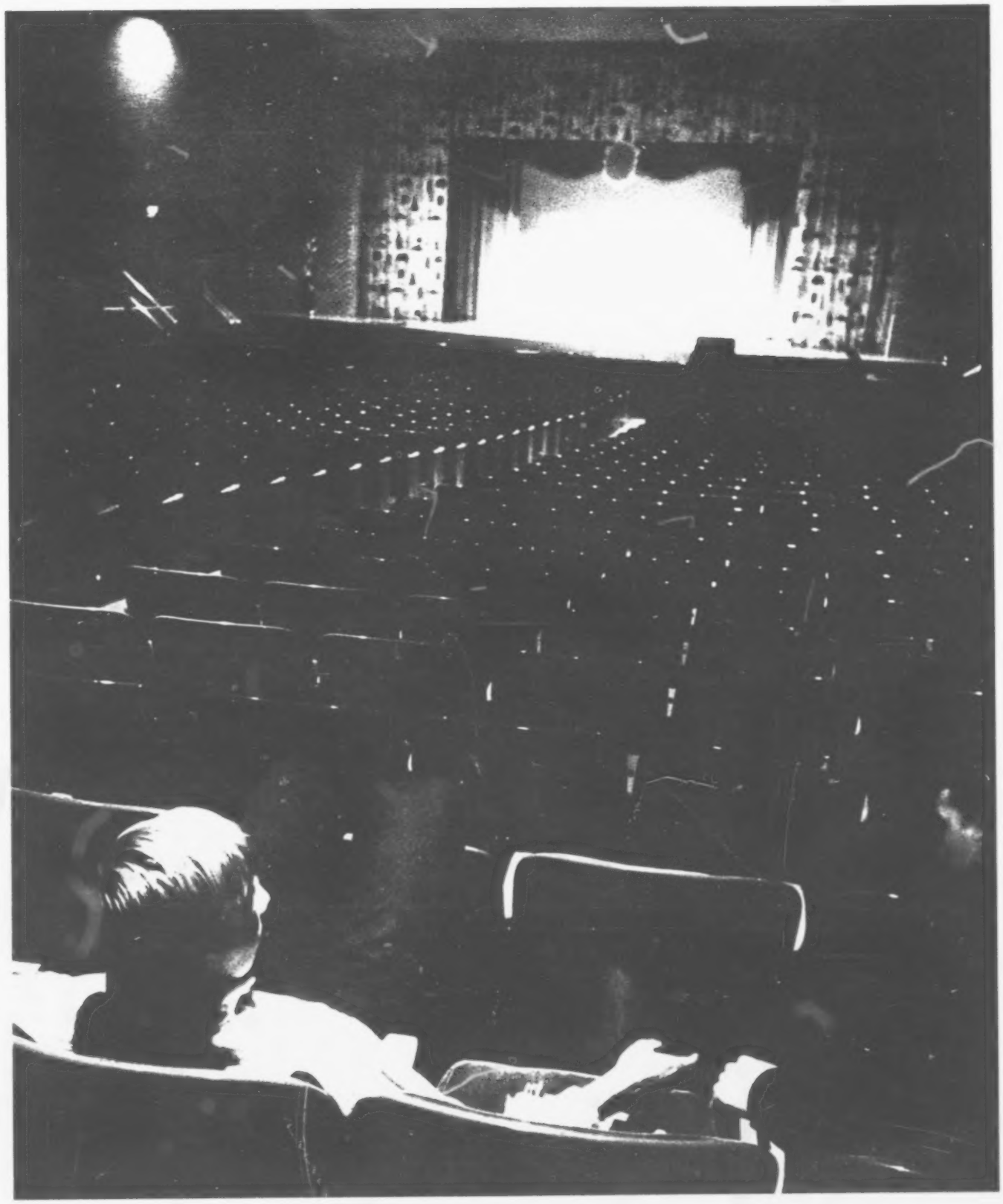
be installed in furred ceiling spaces above an auditorium. Heavy equipment, such as cooling towers, should be placed above secondary rooms, as close as possible to columns or other firm supporting elements. Unitary equipment, such as under-window fan coil units or roof exhausters, should be avoided in all lecture rooms.

In all remodeling, the architect's prime requisite is an awareness of potential acoustical problems and the creative solutions available to him. Although the physical aspects of room acoustics, sound systems, or noise control installations are the same in both new and remodeled structures, remodeling can create special problems. The architect should be alert to them and to the use of acoustical controls.

Suggested Sound Transmission Class (STC) Ratings for Partitions

The table ranks various typical activities in order ranging from noisiest and most disturbing to quietest and most easily disturbed and indicates an approximation of the required sound isolation between these activities.

FROM → TO	Orchestra & Chorus	Motion Picture & Phonograph	Music Ensemble & Indiv. Practice	Gymnasium	Shops—High Noise	Shops—Low Noise	Recreation	Lab & Home Economics	Lounge & Common	Lecture Rooms	Study & Examination
Orchestra & Chorus	65	65	50	20	15	20	20	50	50	65	65
Motion Picture & Phonograph	65	50	50	15	15	15	15	50	50	50	50
Music Ensemble & Indiv. Practice	50	50	50	0	0	0	15	15	15	50	50
Gymnasium	35	35	20	0	0	15	15	20	20	50	50
Shops-High Noise	50	50	35	15	0	35	50	50	50	65	65
Shops-Low Noise	35	35	20	15	0	0	0	15	15	35	35
Recreation	35	20	15	0	0	0	0	15	15	35	35
Lab & Home Economics	20	15	15	0	0	0	0	0	15	35	35
Lounge & Common	20	15	0	0	0	0	0	35	0	35	35
Lecture Rooms	35	20	0	0	0	0	0	35	35	35	35
Study & Examination	0	0	0	0	0	0	0	0	0	0	0



Stage Design

by James Hull Miller

The conventional proscenium stage is not the only, or necessarily the first, idea that comes to mind for a theater in a school. A desirable variety of performing arrangements may be achieved in a number of ways. Platform stages may thrust forward or assume a number of shapes which will permit interesting audience groupings and provide versatility for the functions to be served. There may also be retractable stages, side areas which may be used for seating or performing as required, and movable platforms which can be arranged as desired.

With this scope in staging and with the use of folding seats, much freedom is allowed in the selection of material and the manner of presentation. This freedom generates excitement and a desire to participate on the part of students and faculty. Increased proximity to the audience lends intimacy and invites involvement.

There are two distinct methods of arranging scenery on a stage. One is to place the scenery around the acting area; the other, to locate the scenery within it. Scenery which surrounds the acting area is usually defined by some sort of masking, or by a proscenium frame. Scenery located within an acting area is three-dimensional, like sculpture. Its profile is important, and it must be self-supporting. Such units are called set pieces.

With scenery self-supporting and space-centered, the scenic artist controls the magnitude of a set, and the stage may be any size or shape. By commitment to set piece technique, it is possible to bring drama onto an open platform, the kind of stage that is ideal, both visually and acoustically, for other school activities such as lectures, concerts, and ceremonies. Since set pieces are more compact than picture-frame scenery, stagecraft materials go farther and storage requirements are lessened.

Set pieces have a distinguished history in both Western and Oriental drama. A resurgence of interest in the set piece has come about in the last decade, partly as a result of new playwriting styles which demand more flexible staging, and partly because of the emphasis placed upon the plastic nature of live theater, as opposed to television and motion pictures. Set pieces are ideal for complex plays because scenes may be arranged in a variety of ways. The high degree of skill and creative possibilities in the crafting of these pieces particularly appeals to young people.

Of course, the architecture of the auditorium forms the background for the platform stage as well, and this must be borne in mind when the building is designed. Proper illumination is also important, but need not be expensive. Since platform staging requires no curtains or masking pieces overhead, spot lighting and general illumination can be arranged more efficiently and at less cost than comparable systems in proscenium frame theaters.

Audio-Visual Considerations

by Morton C. Gassman

Media, as part of the educational system, dictate special considerations for classroom environment. Not only must the design provide good viewing and listening facilities and a comfortable environment for each student, but it must also be flexible enough to serve, with equal efficiency, the needs arising from a variety of situations.

The necessity for note-taking during an instructional presentation makes a variable system of illumination mandatory. Such a system should be capable of producing several light levels at the student writing surface, and these levels should approximate the amount of light produced on the screens by various projectors or monitors.

Ambient or stray light falling upon the viewing surfaces washes out the image. A variety of louvres and fixtures capable of limiting the spread of overhead lighting are available. These should be located to avoid excessive shadows on the writing surfaces, and a series of downlights should be provided at the front of the classroom to illuminate teachers, live demonstrations, tackboards, and vertical writing areas.

Good acoustics and sound control are especially important, and distribution throughout the room is not so great a problem as the isolation of sound from adjoining spaces. Acoustical design should be applied early in the planning process.

In order to be alert and responsive, the student must not only be able to see and hear, but be physically comfortable. Temperature and humidity should be controlled to offset the effects of special lighting, windowless presentation rooms, and year-round operation, as well as to promote optimum student performance.

Viewing screens may be of front or rear projection types, since with complete lighting control either kind is acceptable. However, as screen size increases with the size of the audience, more projector lumen output is needed to produce an image of adequate brightness. Standard projection equipment can be used for image widths of less than eight feet. The minimum distance from viewer to screen is generally accepted as twice the width of the screen. The maximum lies between six and eight times screen size.

If student sight lines are to be free from interference, stepped or sloped seating will be necessary in rooms containing more than four rows. It is possible to place two rows on one level if the seating is staggered. However, the designer should be careful to avoid making close viewers uncomfortable by locating his screen too high.

The lecture rooms developed for St. Louis' Roosevelt High School show how renovated space can be adapted for optimum media use. Preparation, storage, and rear screen projection areas were located in lecture rooms 1 and 3 to make these spaces media-oriented. The side limits of the viewing area are determined by using a 40-degree edge angle. Each room contains a 7- by 14-foot, flexible, white, wide-angle rear projection screen capable of receiving two simultaneous images. The rear projection area is designed to accommodate two 35mm projectors, a 16mm projector, and a television projector. The right screen module (7 by 7 feet) would be used for 35mm or 16mm projections, and the left for 35mm and television projections. The distance from the rear wall of the projection area to the screen is 12 feet 6 inches, producing, with wide-angle lenses, 7-foot 16mm and 35mm images and a projected television image 5 feet 3 inches wide.

Lecture room two at St. Louis' Roosevelt is flexible. By introducing a hinged, roll-on screen and portable projection units, this space can be converted quickly from an auditorium to an audio-visual facility. Screen and projector locations should be clearly defined on the stage floor and conduit placed for the acceptance of media.

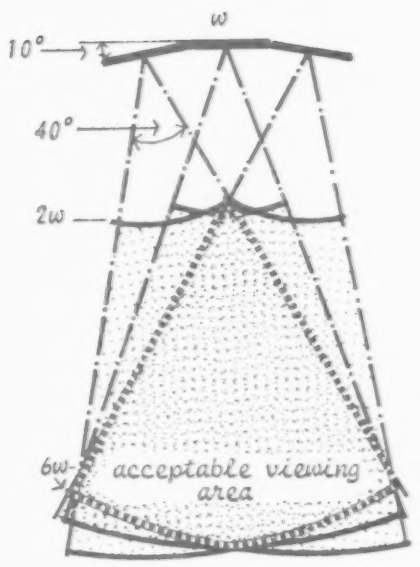
Lighting systems in this room and all other media-oriented spaces need not be complicated. Not more than one footcandle of ambient light should be permitted to fall on the screen surface, but an economical switching system, capable of providing three illumination levels can be obtained by using three-tube fluorescent fixtures. By wiring the fixtures to light one, two, or three tubes and by providing louvres to limit spread, the system becomes effective without adding expensive dimming equipment. It should produce two levels of light approximating the average brightness of the various projectors and a third for normal classroom lighting. These circuits are then tied into the teacher's control panel and matched with the appropriate projectors so that a single control is possible for both projector and light level.

In brief, when designing the media-oriented room, the architect should keep the following suggestions in mind:

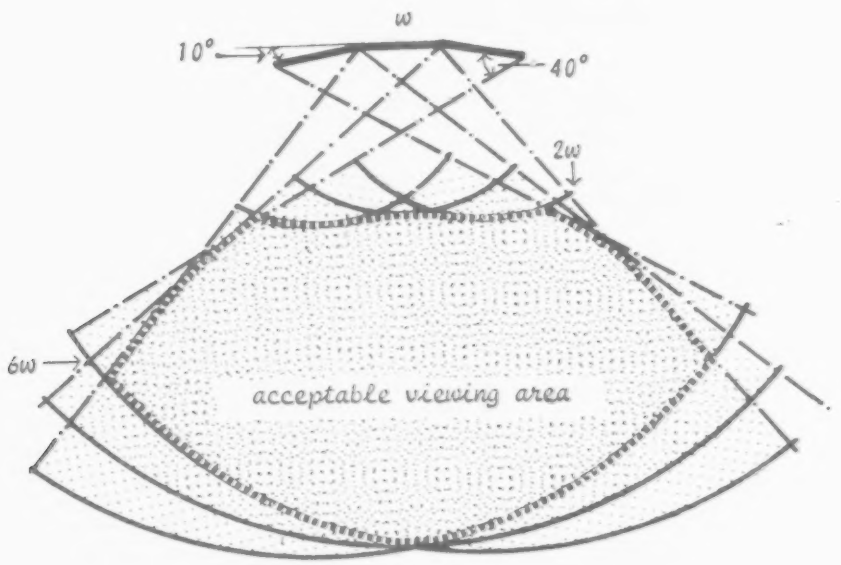
1. For rear screen projection offering the widest viewing angle, projector and screen should be separated by a distance equivalent to twice the width of the projected image.
2. All screens should be protected from ambient light.
3. The floor adjacent to the screens should present a dark, nonreflective surface.
4. Student writing surfaces should be tilted slightly away from the screen.

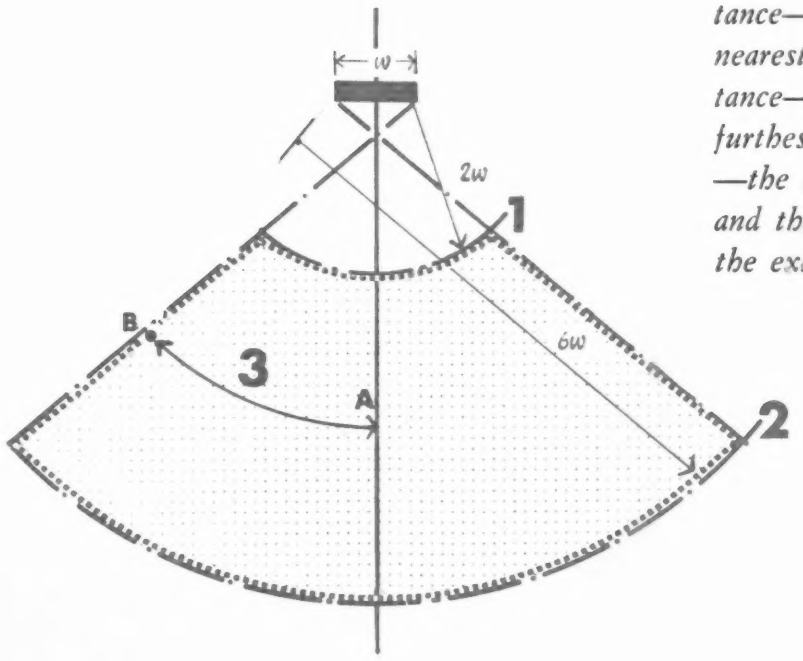
By carefully planning today's media-oriented rooms, advancing technology will not make them obsolete, but will produce even better viewing conditions. Display methods may change or improve, but if room design is predicated on a fixed relationship between the student and what he must see, the efficiency of his facilities will remain unaffected.

A general rule might be that with any given projector the brightness of the image will be greater when using screens with narrow viewing characteristics. However, image brightness is only a relative thing and the essence is the ability of the student to see clearly and easily distinguish the projected information. The projection of multiple images limits the use of narrow viewing screens since the addition of each screen reduces the acceptable viewing area.



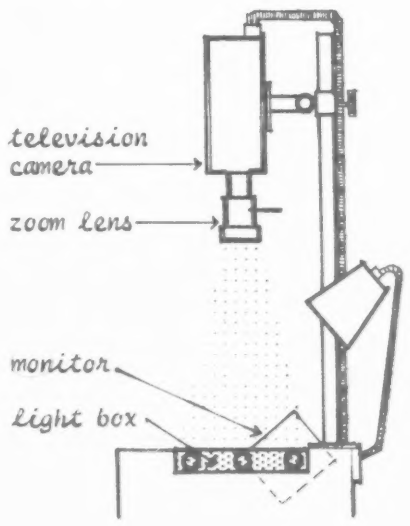
While the same is true of screens with wide-angle characteristics, the acceptable viewing area is much larger.



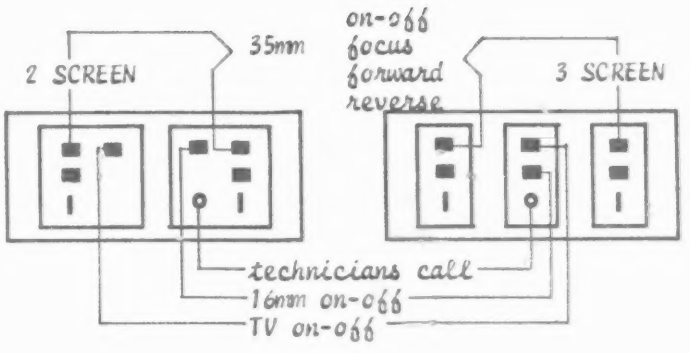


Viewing areas are determined by the following three dimensions: (1) Minimum viewing distance—the distance from the screen to the nearest observer. (2) Maximum viewing distance—the distance from the screen to the furthest observer. (3) Maximum viewing angle —the angle between the projection axis (A) and the line of sight of the viewer located at the extreme edge (B).

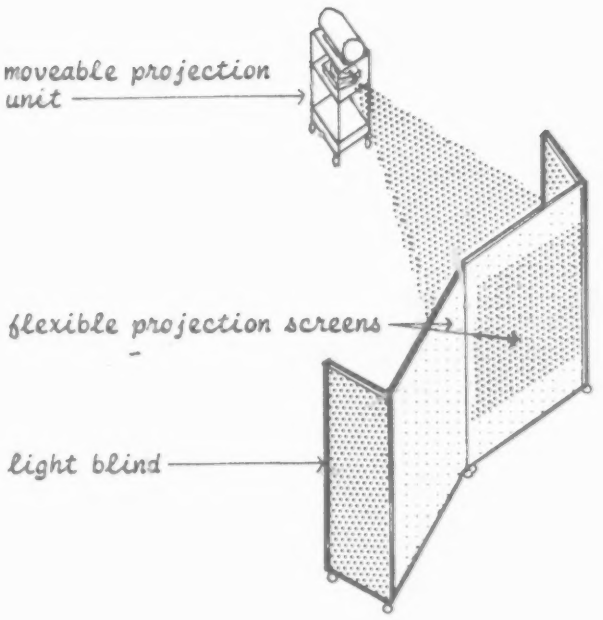
The rear projection area should be acoustically treated to absorb the projector sounds and painted matte black to prevent light from being reflected to the screens. The white screen will accommodate the use of the overhead projector when required. A closed circuit television system may be incorporated within the classroom. With an overhead mounted television camera, a zoom lens, and a light box, this becomes a black and white version of both the overhead and opaque projectors.



Obviously, the teacher's control console must be designed for ease of operation. Over-complicated control panels can discourage the use of the audio-visual equipment. Moreover, light controls should be integrated with the projector switch, and the panel should be designed with a minimum of flashing lights and buttons.



The hinged, roll-on screen is composed of two wide-angle, flexible, rear projection screens, each 8 feet square, and fitted with side blinds to prevent ambient light from reaching behind them. A roll-on projection stand might hold a 35 mm projector and a 16 mm or television projector, with cart cables designed to plug into floor outlets carrying power and control circuits.



Other Reports from EFL

BRICKS AND MORTARBOARDS. A guide for the decision-makers in higher education: how the colleges and universities can provide enough space for the burgeoning enrollments of this decade; how the space can be made adaptable to the inevitable changes in the educational process in the decades ahead. (One copy available without charge. Additional copies $1.00.)

COLLEGE STUDENTS LIVE HERE. A report on the what, why, and how of college housing; reviews the factors involved in planning, building, and financing student residences.

THE COST OF A SCHOOLHOUSE. A review of the factors contributing to the cost and effectiveness of schoolhousing, including planning, building, and financing.

DESIGN FOR ETV—PLANNING FOR SCHOOLS WITH TELEVISION. A report on facilities, present and future, needed to accommodate instructional television and other new educational programs. Prepared for EFL by Dave Chapman, Inc., Industrial Design.

RELOCATABLE SCHOOL FACILITIES. A survey of portable, demountable, mobile, and divisible schoolhousing in use in the United States and a plan for the future.

THE SCHOOLHOUSE IN THE CITY. EFL's annual report for 1965 and an essay on how the cities are designing and redesigning their schoolhouses to meet the problems of real estate costs, population shifts, segregation, poverty, and ignorance.

THE SCHOOL LIBRARY. A report on the facilities for independent study, with standards for the size of collections, seating capacity, and the nature of materials to be incorporated.

The following publications are available without charge from the offices of EFL: *477 Madison Avenue, New York, New York 10022.*

SCHOOL SCHEDULING BY COMPUTER / THE STORY OF GASP. A report of the computer program developed by MIT to help colleges and high schools construct their complex master schedules.

SCSD: AN INTERIM REPORT. A first report on the School Construction Systems Development Project—the first project in the United States to coordinate the design and use of a series of integrated components to build better schools more economically.

TO BUILD OR NOT TO BUILD. A study of the utilization of instructional space in small liberal arts colleges, with a do-it-yourself workbook for the individual use of the institutions that wish to survey their own utilization levels.

Profiles of Significant Schools

A series of reports which provide information on some of the latest developments in school planning and design.

HOLLAND HIGH SCHOOL—Holland, Michigan
HIGH SCHOOLS 1962—educational change and architectural consequence
SCHOOLS WITHOUT WALLS—open space and how it works
MIDDLE SCHOOLS—controversy and experiment

Case Studies of Educational Facilities

A series of reports which provide information on specific solutions to problems in school planning, design, and construction.

6. A COLLEGE HEALTH CENTER. Case study of a model center for small private colleges; architectural design by Caudill, Rowlett & Scott.

7. NEW BUILDING ON CAMPUS: SIX DESIGNS FOR A COLLEGE COMMUNICATIONS CENTER. Graphic representations of the results of an architectural competition for a new space to house the accouterments of instructional aids and media.

8. THE SCHOOLS AND URBAN RENEWAL. A case study of the Wooster Square renewal project in New Haven, Connecticut.

9. AIR STRUCTURES FOR SCHOOL SPORTS. A study of air-supported shelters as housing for playfields, swimming pools, and other physical education activities.

10. THE NEW CAMPUS IN BRITAIN: IDEAS OF CONSEQUENCE FOR THE UNITED STATES. Recent British experience in university planning and its implications for American educators, architects, and planners.

11. DIVISIBLE AUDITORIUMS. Operable walls convert little-used auditoriums and theaters into multipurpose, highly utilized space for the performing arts and instruction.

Technical Reports

1. ACOUSTICAL ENVIRONMENT OF SCHOOL BUILDINGS by John Lyon Reid and Dariel Fitzroy—Acoustics of academic space in schools. An analysis of the statistical data gathered from measurement and study.

2. TOTAL ENERGY—On-site electric power generation for schools and colleges, employing a single energy source to provide light, heat, air conditioning, and hot water.

College Newsletter

A periodical on design questions for colleges and universities.